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FORMERLY MODERN MECHANIX

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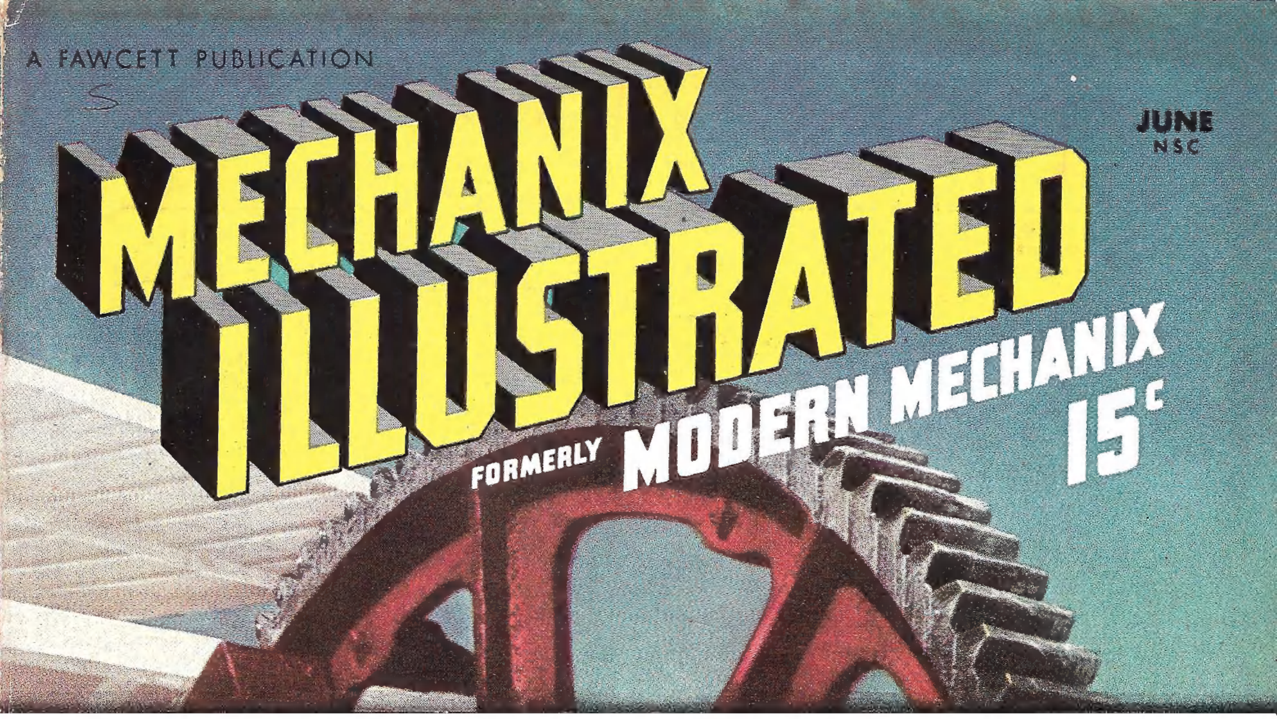

A Message for Men from LOWELL THOMAS

Handicraft • • • Hobbies • • • Inventions

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JUNE 1938—15 CENTS

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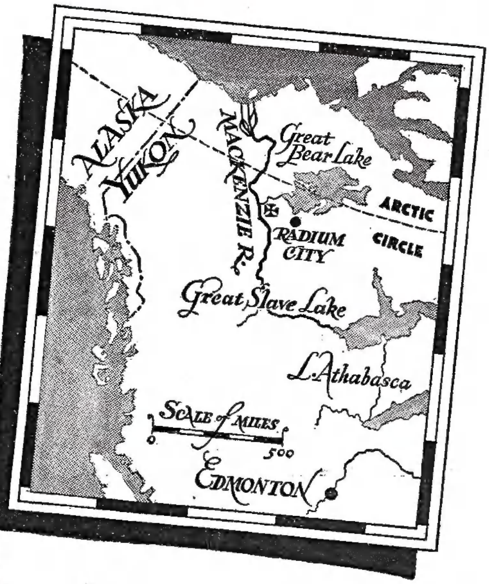
ADRIFT WITH DYNAMITE on STORM-TOSSED BARGE!

MACKENZIE ON RAMPAGE, SENDS LONE BARGEMAN TOWARD ARCTIC ICE


ALASKA
YUKON
MACKENZIE R.
Great Bear Lake
ARCTIC
CIRCLE
RADIUM CITY
Great Slave Lake
L. Athabasca
SCALE of MILES
0
500
EDMONTON

"My home was the barge, anchored in the middle of the Great Bear River, which we used in transhipping freight for Radium City into the small high-powered rapids boats," writes T. H. Inkster, F.R.G.S., writer, explorer, British war time flyer.

"One night, with the barge loaded with freight, including hundreds of cases of dynamite, a terrific storm blew up, my anchor dragged. Bobbing like a cork the great barge was swept down toward the broad Mackenzie. It pitched against the bank with a force that threw me off my feet, and started on again.

"Once in the Mackenzie I'd be Arctic-bound! Somehow I must get a line on shore. It seemed impossible, but I yelled at the top of my lungs...I heard dogs barking. Then as I flashed my light on the shore, a trapper who was camping near by came running down to the water's edge.

"I heaved the line for all I was worth... the trapper got it! Then I focussed the light on a big tree while he made it fast. Later, we had a good laugh over it...but right then I fully realized that but for the trapper's help and my *fresh* DATED 'Eveready' batteries I would have been drowned or blown to bits when my barge drove on the rocks downstream!

(SIGNED) T H Inkster"

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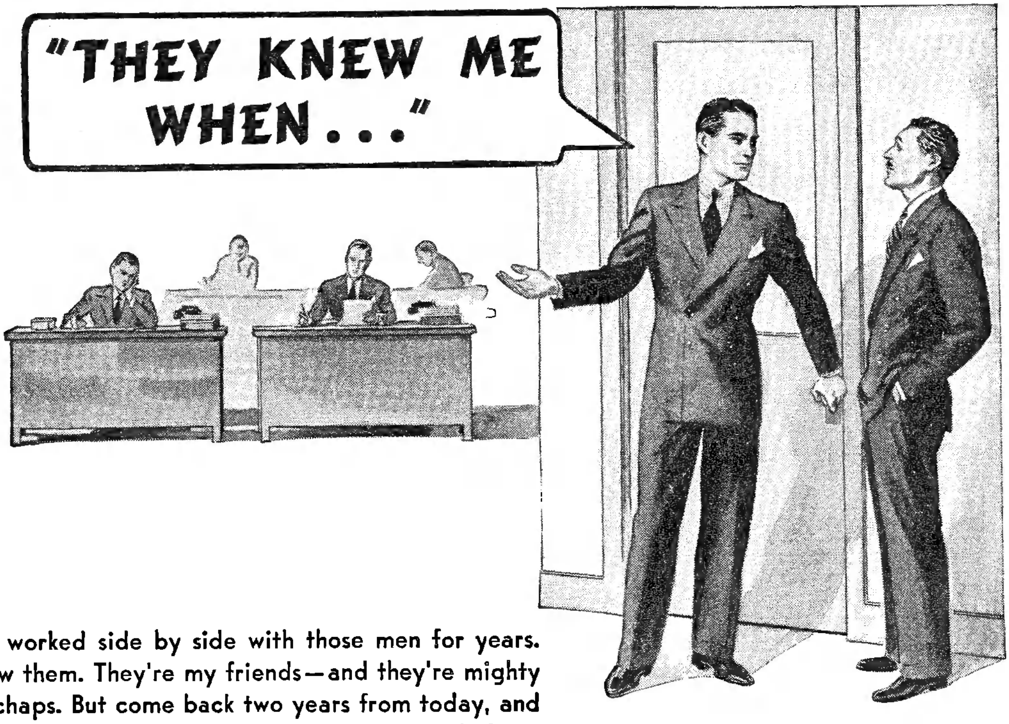

● "I worked side by side with those men for years. I know them. They're my friends—and they're mighty fine chaps. But come back two years from today, and you'll see those same men at those same desks.

"They lack sufficient training to go much farther in this business. So did I—until I faced the cold, hard facts of my own case. It wasn't long after that that I enrolled as a student with I. C. S. The training I got in that course fitted me for advancement—and I've been on the up-grade ever since."

How about yourself? Are you honestly *equipped* to hold a bigger job? Think it over. The coupon below is the same one that started thousands of men toward success.

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Published monthly by Fawcett Publications, Inc., 11th St., & Broadway, Louisville, Ky., U. S. A. Business office, 22 West Putnam Ave., Greenwich, Conn. Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Editorial offices: 1501 Broadway, New York, N. Y. Not responsible for unsolicited manuscripts. In U. S. and Possessions and in Canada, 15c a copy; $1.50 a year. Send subscriptions to Greenwich, Conn., address. Other Postal Unions, $2.00 a year. East Indian Agent, P. C. Eranee Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulation.

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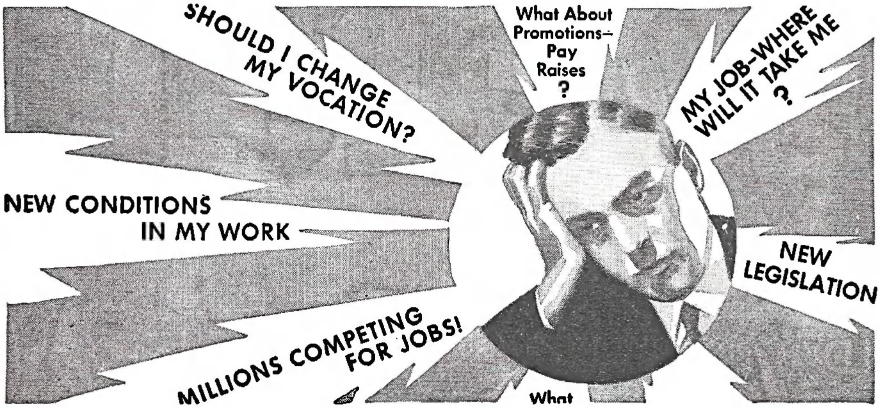
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What

WHERE DO YOU GO FROM HERE?

YOU'RE like a million other men—you're facing a *big* question. The depression turned business topsy-turvy and now the rebuilding period stares you in the face.

Are the things that are happening today going to help or hinder you—what will they mean in your pay check? Where will they put you five, ten, twenty years from now? How can you take full advantage of this period of opportunity?

We believe you will find the answer here—a suggestion the soundness of which can be proven to you as it has been to thousands of other men.

The whole trend today—legislation, spirit, action—is to put men back to work, raise earning and spending power, *give every man a fair chance to work out his own salvation.*

The road to success remains unchanged but, bear this in mind, *what it takes to win is radically different!*

No employer today would dare risk an important post in the hands of a man who had not learned the lesson of '29. Why should he, when right at this moment he can pick and choose and get almost any man he wants at his own price?

Business organizations are rebuilding—reorganizing for the new conditions. Before it is over every man and every method will be judged in the cold light of reason and experience—then dropped, remade or retained. This spells real opportunity for the man who can meet the test—but heaven help the man who still tries to meet today's problems from yesterday's standpoint! Out of the multitude still jobless there are sure to be many frantically eager to prove him wrong and take his place.

Some Men Have Found the Answer

Seeing these danger signs, many aggressive men and women are quietly training at home—are wisely building themselves for more efficient service to their employers.

You naturally ask, "Has your training helped men withstand conditions of the last few years?"

Our answer is to point to a file of letters from many of our students reporting *pay raises and promotions while business was at its lowest ebb*—together with a myriad of others telling of greater success during these recent months of recovery.

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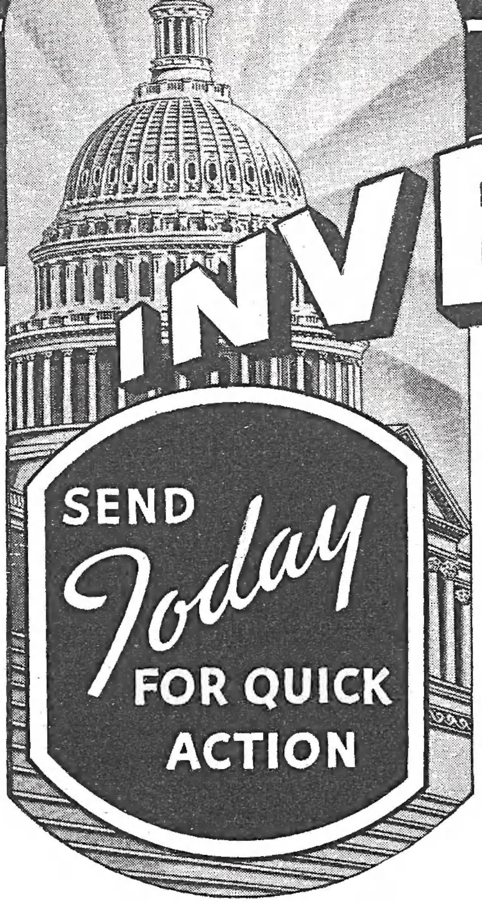

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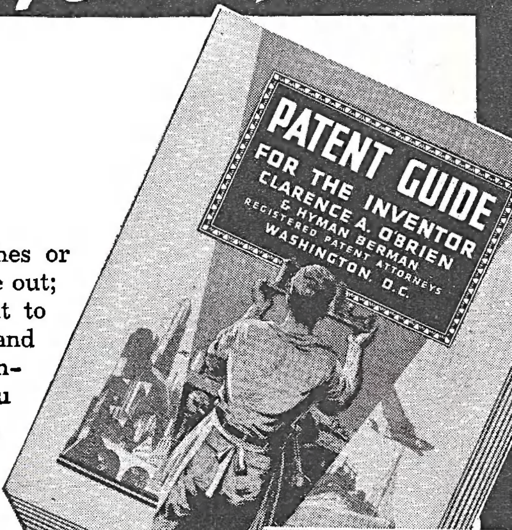

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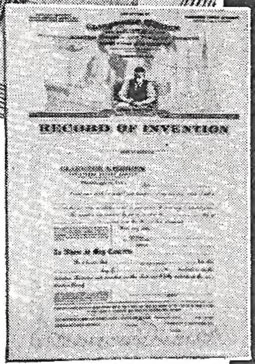

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"THE BOSS DIDN'T EVEN KNOW MY NAME"

"HE SAID my face was more or less familiar and he remembered seeing me around, but he didn't even know my name until the I. C. S. wrote him that George Jackson had enrolled for a course of home study and was doing fine work.

"'Who's George Jackson?' he asked. Then he looked me up. Told me he was glad to see I was ambitious. Said he'd keep his eye on me.

"He did too. Gave me my chance when Frank Jordan was sent out on the road. I was promoted over older men who had been with the firm for years.

"My spare-time studying helped me to get that job and to keep it after I got it. It certainly was a lucky day for me when I signed that I. C. S. coupon."

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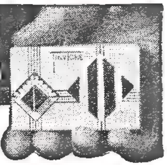

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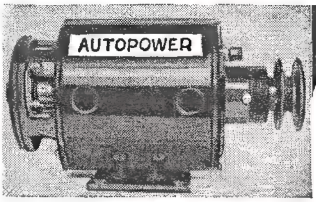

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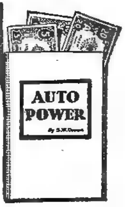

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ARTISTS STUDENTS

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READ ABOUT THIS *Man*

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PATENT PROTECTION
Suggestions on WHEN and HOW to Sell an INVENTION
Evidence of Invention
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PATENT YOUR INVENTION >>>

IMPORTANT TO INVENTORS

JUST a few years ago, during the depression, a man named Charles Brace Darrow, of Philadelphia, Pa., found himself out of a job. He started tinkering and thinking, using the kitchen table for a workshop. In the course of a few months he had developed a new kind of parlor game. His friends tried the game, and liked it, so Darrow applied for a patent. The name of Darrow's game was "MONOPOLY"—and it is said that he has made a substantial fortune from it.

The procedure followed by Darrow was correct. First, develop your idea. Then make a record of it, show and explain it to friends whom you can trust. Then move to seek the protection of a U. S. Patent.

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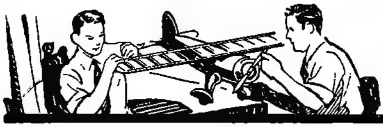
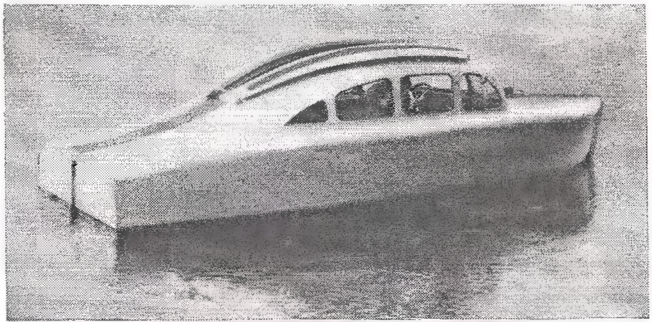
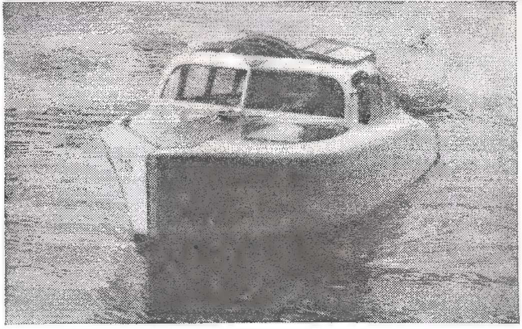


Chips from the





Built by Lloyd Spriggle, this trim streamlined motorboat is certain to win the admiration of all boating enthusiasts.

IT WILL take you longer to read this issue of MECHANIX ILLUSTRATED than previous issues of your old friend "Modern Mechanix," for the simple reason that we have added 16 solid pages to the editorial section! I am sure that you will like the many extra articles, the descriptions of new ideas and inventions, the big pictures, and the enlarged drawings of construction projects. True to its name, MECHANIX ILLUSTRATED will emphasize *illustrations* of *mechanical* developments; it will publish live, human-interest photographs that you will find interesting, instructive and helpful.

Workshop fans will, I am sure, be pleased to know that more space will also be given to the ever-popular "Workbench" Department. Every month we receive hundreds of fine letters and pictures showing shop projects made from our plans and blueprints and we intend to publish as many as we can, to show how capable and skillful MECHANIX ILLUSTRATED readers really are. Send in your letters and photos for judging in next month's Workbench contest.

***

First on the line this month is Lloyd Spriggle, of Bay City, Wis., who was awarded a $5 prize for his photos and letter describing his home-built boat. He writes:

Dear Editor:

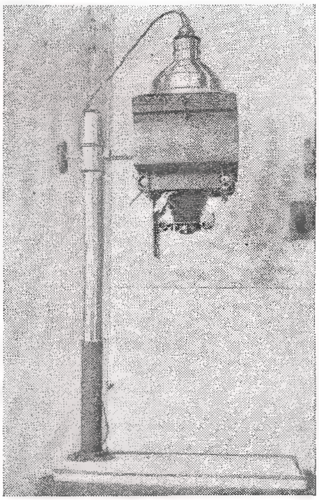
I am enclosing prints of my home-built boat. The rumble seat is enclosed by a cover which has sliding doors. When closed, the doors drop flush with the top creating a perfectly streamlined unit, which is strong enough to walk on.

Lloyd Spriggle.

You didn't supply any information about speed, construction time, etc., Lloyd, but I just had to award you a prize because of the boat's appearance. It sure is a beauty.

***

Remember the photo enlarger plans that appeared in our March issue? Well, C. E. Prange, of Toledo, Ohio, scored a $3 prize by sending in a photo of the enlarger that he built from those plans. He says:



C. E. Prange built this photo enlarger from plans in our March, 1938 issue.

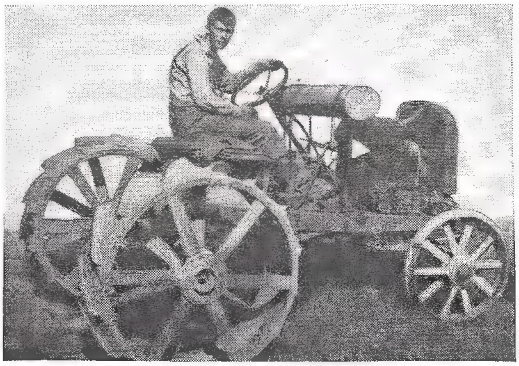
Dear Editor:

Here is a photo of the enlarger that I constructed from the plans in your March issue. It gives excellent results.

Your amateur photography section is great and I have received some good ideas from it.

C. E Prange.

Thanks for



Johnnie Bray and his home-built "five mule-power" tractor.

Editor's Workbench

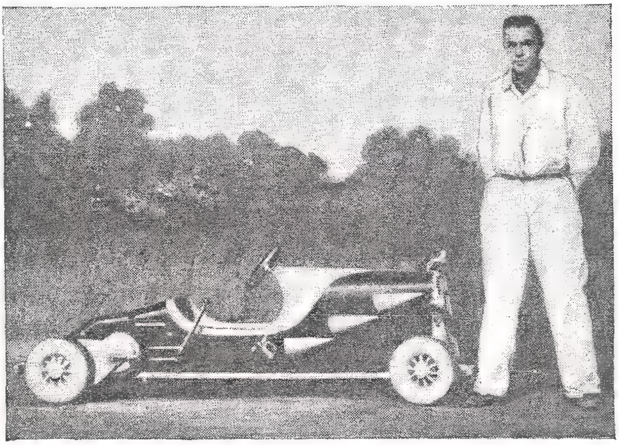
the kind words, Prange. I'll do my best to keep you amateur photo fans supplied with practical suggestions and how-to-build articles. Incidentally, the enlarger plans are reprinted in our new PHOTOGRAPHY HANDBOOK, now on sale at camera stores and on newsstands everywhere.

***

I'm not a farmer, but I can tell a good tractor when I see one, and that's why I sent a $3 award to Johnnie Bray, of Pinson, Tenn., whose letter reads:

> Dear Editor:
> The enclosed photo shows a tractor built by my brother and me. It features a four-cylinder engine and differential which were salvaged from old autos. The machine does the work of five mules and has six forward speeds and one reverse. The total construction cost was only $20, as we used parts from seven old autos and one tractor to build it.
> Johnnie Bray.

I wish I could invest $20 as profitably as you apparently have done, Johnnie!



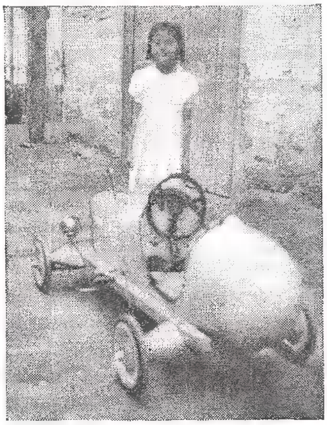
Harold Huntley sent in this photo of a racer built by a friend.

***

You fellows who itch to get behind the steering wheel of a little four-wheeled "put-putter" will be interested in the letter I received from William Graham, of Hazel Park, Mich., who was also awarded a $3 prize. He says:

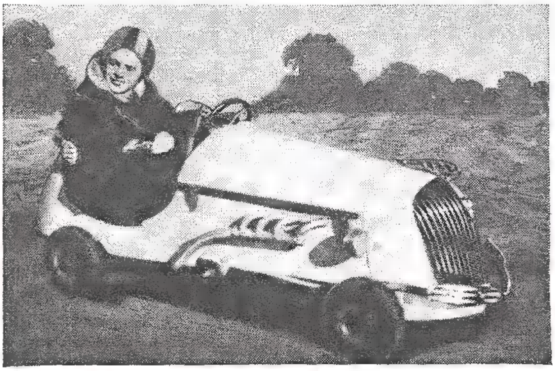
> Dear Editor:
> Enclosed is a photo of the midget racer which I built for my son from your plans. It is powered by a $1\frac{1}{2}$-horsepower lawn mower engine hooked up with a chain and V-belt drive. For safe operation I geared the car so that it will go 10 m.p.h.
> William Graham.

I bet young Graham gets as much thrill when going 10 m.p.h. in his racer as some of you older fellows do when you eat up the road at 70 or even 100 m.p.h. Take it easy, fellows, or "life may end at 40!"



Capable of going 40 m.p.h., this tiny racer was built by Froilan de los Santos, in far away Manila, P. I.

***



William Graham built this midget car for his son. Lucky boy!

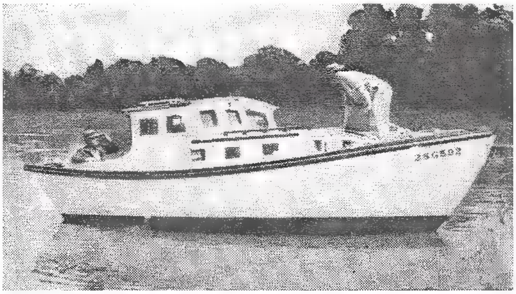
From the far away Philippine Islands I received a letter from another midget-racer enthusiast, Froilan de los Santos, who was also winner of a $3 award. His letter reads:

> Dear Editor:
> I am a constant reader of your magazine. It is the real thing when it comes to dishing out information on mechanical projects. The enclosed photo shows a midget racer which I constructed with the help of your information.
> The car is powered by a motorcycle engine and goes 40 m.p.h. at full gun. With the exception of the engine, wheels and headlights, everything is home-built, even to the small steering wheel.
> Froilan de los Santos.

[*Continued on page* 16]

Chips From The Workbench

[*Continued from page* 15]



E. Langille's version of "Dorothy," a MECHANIX ILLUSTRATED boat. He deviated from plans only in adding a pilot house, making it a good all-weather craft.

As the saying goes, Froilan, "you've got something there."

***

There's no escaping these midget-racer fellows. Harold Huntley, of Kings Park, L. I., sent in a photo and letter that reduced the MI (Mechanix Illustrated, to you) treasury by $3 in the form of a Workbench award. He says:

> Dear Editor:
>
> I am enclosing a photo of a midget racer that a friend of mine constructed It is powered by a 3/4 horsepower washing machine motor and runs all day on a gallon and a half of gasoline.
>
> The car operates under a regular license and is capable of a speed of 25 m.p.h., but cannot be reversed. It is started by stepping on a pedal connected to the engine.
>
> Howard Huntley.

If Harold shares his $3 award with his friend, he will be able to buy enough gas to run his midget car for—well, you figure it out.

***

Being a boat lover myself, I warmed right up to a photo and letter sent in by E. Langille, of San Francisco, Calif. (The "warming up" cost MI a $3 prize.) His letter states:

> Dear Editor:
>
> Here is a photo of "Dorothy" which I built from plans in your book—How To Build 20 Boats. I added a pilot house, but the rest of the boat is constructed exactly according to your plans.
>
> The boat has proved to be a good rough-water craft and I can assure you that the open Pacific Ocean is not always what its name implies.
>
> E. Langille.

If anything, Langille, the pilot house has added to the boat's appearance. Good work!

***

D. B. Thomson, of the National Aero Reserve, whose letter on the home-built airplane situation in our December, 1937 issue resulted in a flood of letters to the MI office, requests that all present and would-be plane builders contact the NAR regarding a bill that organization intends to present to Congress in an effort to secure modification of the laws governing the flying of home-built planes. Be sure and include a stamped, addressed return envelope when writing to the National Aero Reserve at 114 West 16 St., New York, N. Y.

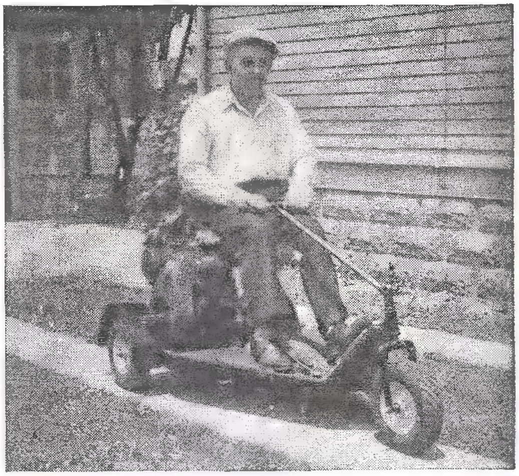
By the way, if any of you fellows think that the home-built plane situation is hopeless, wait until you read the article on the State of Oregon's handling of the matter in a future issue of MI.

***

Powered scooters are becoming more and more popular. A photo and letter I received from Russell Harter, of New Castle, Ind., thoroughly merits the $3 award which was sent to him. He writes:

> Dear Editor:
>
> Enclosed is a photo of a three-wheeled power scooter which I constructed from odd parts. The complete frame is made from gas pipe and fittings. Powered by a one horsepower, four-cycle motor, the scooter can travel 27 m.p.h. and will carry me 50 miles on a gallon of gasoline.
>
> The scooter features two speeds, an internal brake, universal joint steering, a spring seat and pneumatic tires.
>
> Russell Harter.

The "voice of experience" tells me that there will be many requests for reader Harter's address as MI craftsmen feel the urge to duplicate his



Ready for a jaunt over neighborhood roads at 27 m.p.h., Russell Harter sits comfortably on his home-built power scooter.

[*Continued on page* 18]

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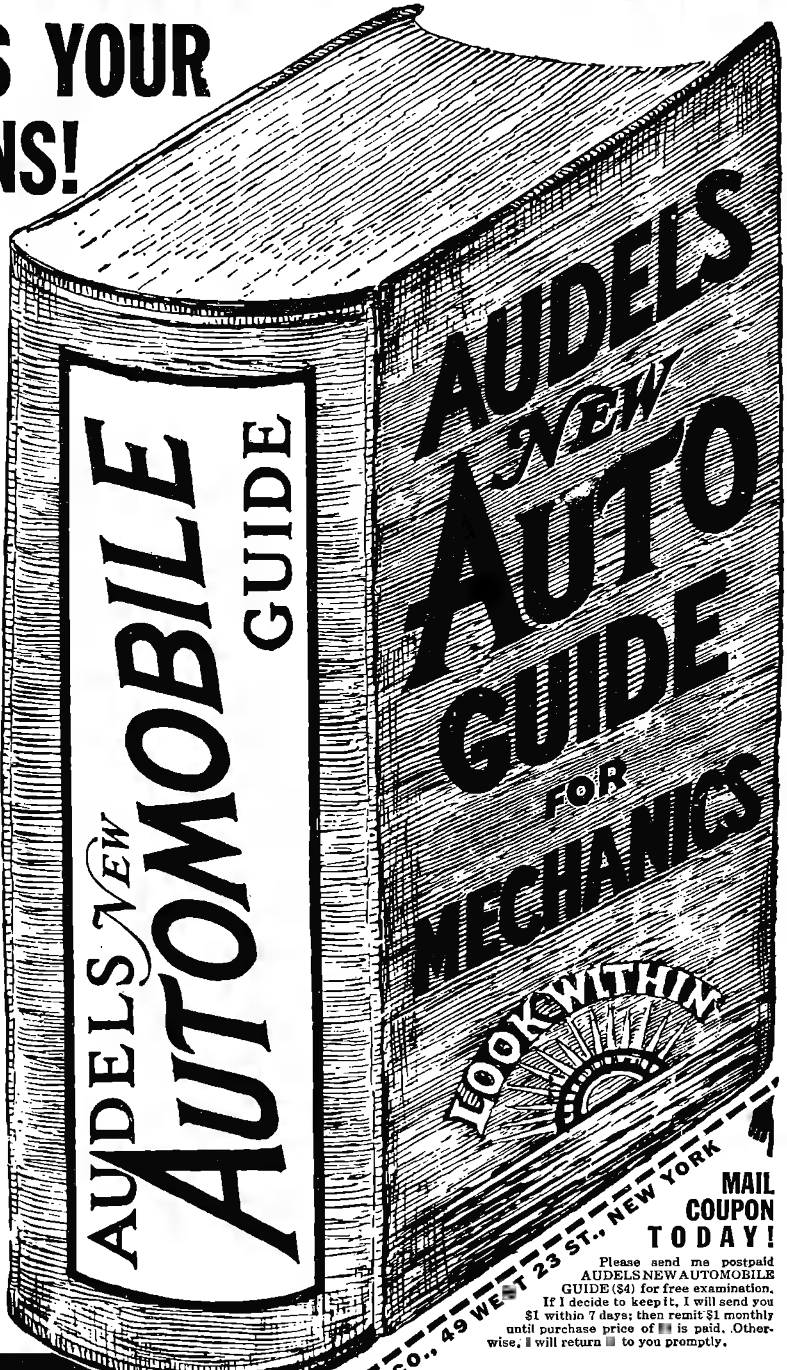

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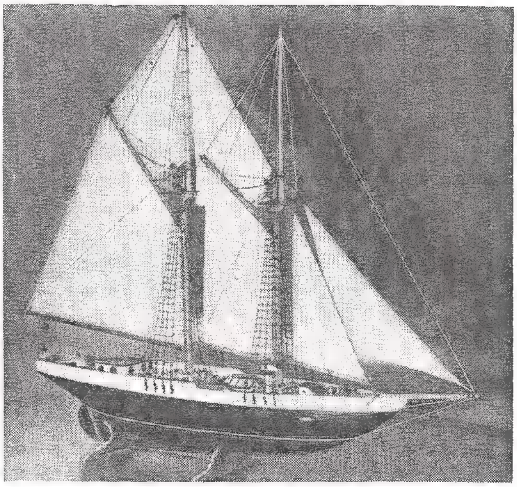
Chips From The Workbench

[*Continued from page* 16]



Constructed by Walter Ward, this two-masted schooner model would be an appropriate decoration for a boat lover's "den."

scooter. How about it, Harter. Will you answer letters?

***

Are you enough interested in stamps to correspond with an enthusiast living in England? If you are, the following letter will be of interest to you:

> Dear Editor:
>
> I wish to express my appreciation of your very fine magazine. There is no worthwhile counterpart of it over here and I always make a point of passing my copies on to friends.
>
> I should like to correspond with other MI readers who are interested in stamps. My address is: 55 Bearton Road, Hitchin, Hertfordshire England.
>
> **Harold T. Brown.**

***

Have you ever yearned for a "den" decorated with ship models? If you have, you will know how I felt when I saw the photo of the scale model of the schooner shown above. Sent in by Ila M. Ward, of Worcester, Mass., the letter accompanying the photo reads:

> Dear Editor:
>
> I am enclosing a photo of a model schooner built by my younger brother, Walter. The model has an overall length of 23 inches, stands 20 inches high and every inch of it was built by Walter, including sails, anchor, bells, lifeboats etc.
>
> The hull is made from four pieces of wood glued together. It is painted black with a white waterline and red bottom. The sails were made from an old shirt.
>
> Ila M. Ward.

I am pleased to send Miss Ward a $3 prize. Her brother's craftsmanship is certainly first class.

—*The Editor*

Staining Solution Improves Fingerprint Technique

Crime prevention has gone into the biologist's laboratory for its newest weapon. Fingerprint technique has been made more positive and accurate through the adoption of a staining solution known as Flemming's reagent, which blackens the slight fatty deposit in fingerprints and makes the telltale marks show up plainly in many cases where they are too light and faint to be detected by methods previously used.

Science's newest aid to law enforcement comes through the ingenuity of Dr. Francis F. Lucas of the Bell Telephone Laboratories. Dr. Lucas had noticed that on many fingerprints the fine powder commonly employed by the police technicians does not stick. He knew that the stuff that holds the powder on a "good" fingerprint is a slight deposit of the body's natural oil. The problem therefore was to find something to make even a slight trace of this oily material highly visible.

He talked the problem over with some biological friends. They told him of Flemming's solution, which has long been used in preparing tissues for microscopic examination. It is a mixture of solutions of osmic and chromic acid, which turns any fatty or oily substance intensely black. Dr. Lucas proceeded to work out an adaptation of the biologists' technique for fingerprinting use.

Paper bearing suspected fingerprints is first treated with Flemming's solution, and then dipped into a dye which under ultra-violet light glows with a brilliant blue-green hue. The fingerprint stands out black and stark against this shining background. Its finest details can be examined under a low-power microscope, or it can be photographed up to any enlargement desired. If the paper bears print or handwriting, filters over the camera lens can cut off the ink from registering on the film, leaving only the boldly showing fingerprints.

Patents Hole-In-Wing Method To Slow Plane Landing

An ingenious suction method for simultaneously slowing the landing speed of a high speed plane and for increasing the lift of its wings is revealed in a patent granted to Major Alexander P. de Seversky, famous New York designer of high performance military aircraft.

Ports placed near the leading edge of the wing connect with suction ports on the under side of the wing toward the rear. Suction thus created simultaneously slows the ship and cuts turbulence on the upper side of the wing, the inventor explains, thus increasing lift.

Slowing by one means or another the extremely high landing speeds of military aircraft is a problem of growing severity and interest to aircraft designers, it will be recalled in connection with the patent.

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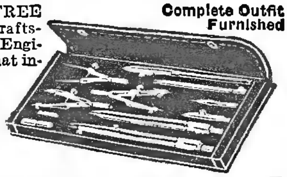

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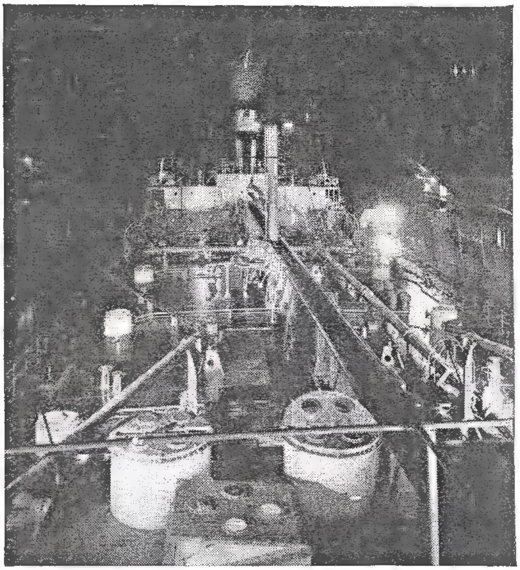


Shown above is a night view from the bridge, looking aft, of the world's largest welded ship, a new 18,500-ton tanker, the S. S. *J. W. Van Dyke.* The vessel has a cargo capacity of 6,552,000 gallons of gasoline—enough to supply the average requirements of nearly 10,000 motorists for a full year. Her overall length is 543 feet; her sea speed 13.25 knots. The *J. W. Van Dyke* is now in service between Philadelphia and Texas Gulf ports, carrying gasoline produced by a well known oil refining company.

Chemical Preserves Fish

A dilute solution of hydrogen peroxide is being used by the fisheries industry of Germany to aid in the preservation of fish, according to Industrial and Engineering Chemistry, journal of the American Chemical Society.

Eviscerated marine fish or fish fillets are given a brief preliminary treatment with a 30 per cent solution of hydrogen peroxide that has been diluted in the ratio one to 100. The treatment is carried out as quickly as possible after the fish are landed and before they are iced for shipment. In odor, appearance and taste the fish thus treated remain in satisfactory condition about three to six days longer than untreated fish.

Craters bored by falling meteorites are known only in a few places on earth.

The silvery look of a dirigible is due to an aluminum coating, which reflects light and keeps the interior cooler.

Photography Used To Detect Counterfeits Of Rare Books

WITH famous early printed books, and even those not so ancient, selling for as much as $5,000 a copy, there is every reason to watch for forgeries or facsimiles that are intended to trick the unwary collector or librarian into paying more than a thousand times what the books are really worth.

Facsimile copies of rare books serve a very useful purpose in making classics available to scholars who can not consult the highly prized and closely guarded originals. But when they are allowed to creep into valuable collections in the guise of the originals themselves, it is like circulating counterfeit money.

One of the leading bibliophile detectives is Dr. L. Bendikson, chief of the Huntington Library's department of photographic reproductions. He tells how to distinguish between a photolithographic copy of a rare document—the most deceiving sort of reprint—and an original. A portion of the disputed page and the corresponding part of the original are photographed upon 35 mm. micro-film and then enlarged. The letters of the lithographed reprint will be found to be not clean cut as they are when they are printed from type. They bulge irregularly in different parts and are irregular in outline. One look is enough to show that the two copies are not the same.

Various lights, microscopy and chemical analysis are also used in this literary detective work. Sometimes the paper or the ink can be shown to be modern whereas the document is supposed to be old.

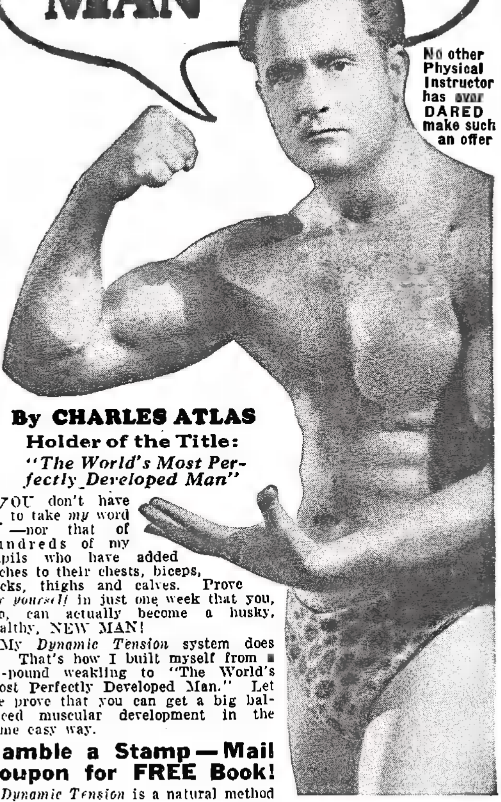
A letter written by Christopher Columbus in 1493 to announce his discovery of what proved to be a new world was the subject of one of the most famous of literary counterfeits, so pronounced in a famous lawsuit in 1899.

Shell Develops High H.P.

At least 10,000,000 horsepower is developed by a main battery or coast defense gun during the short interval in which the projectile moves through the bore, it is revealed in ballistic physics tests made at the Naval Proving Grounds at Dahlgren, Va.

So powerful is a single gun of this type while hurling its ton weight shell that for the moment it has an output greater than the combined output of the power plants propelling the battle fleet of the United States Navy, it is asserted.

Piano keys can be made of plastic in place of the usual ivory.



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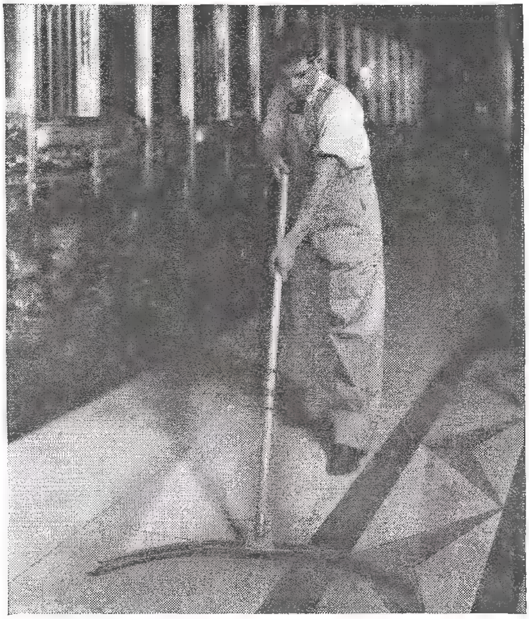

Speedier floor cleaning is said to result through the use of a newly developed curved-blade floor dryer. The blade, made of rubber, holds the water with cleaning material in its curve, carrying it where the operator wants it. As the dryer removes all the water from the pores of the floor and since the water is not picked up until the entire floor is cleaned, fewer rinsings are needed. The device can be used for sweeping the floor without raising dust by placing a damp cloth under the blade.

Praise For Women Drivers

Science has come to the defense of the woman driver. If she is not so efficient as are the men, it is not because of her sex or innate abilities but merely because she lacks the driving experience necessary for greatest skill.

This is shown by test of more than 2,000 persons on vision, reaction, time, and other essential abilities for the automobile driver, made by Dr. A. R. Lauer, associate professor of psychology at Iowa State College.

Only in strength of grip was there any difference between the sexes. Among the younger persons tested, the men were somewhat better than the women in judging distance. Women were somewhat inferior in tests of performance of skills resembling auto driving, due to the lack of experience of those tested.

Device Uses Light Beams To Test Paper Surfaces

How smooth is a piece of paper? Seems simple, doesn't it, when you contrast the feel of a glossy "quality magazine with the rough coarseness of the so-called "pulps."

But your finger will not be sufficient if you are a printer and have to choose the proper ink. To give a definite numerical basis for paper smoothness a device has been patented (No. 2,050,486) by N. M. Davis and H. E. Malmstrom of Appleton, Wis.

A photoelectric cell, glass prisms and plates, a small hydraulic press and a light beam projector are essentials of the device, which utilizes well-known principles of optics.

One of the best known feats of the science of optics is to bend light around corners with internal reflection in prisms. High-grade compact field glasses and submarine periscopes are only two of many devices which use this well-known phenomenon.

If, however, a piece of paper is pressed against the back face of the prism which reflects the light, some of the light is not reflected but passes out of the prism and is lost. The degree of reflection depends on how good is the contact between the prism face and the paper. Good contact great reflection loss; poor contact little light loss.

In the new device a beam of light enters the prism, strikes the two back faces in succession and is caught by the photo cell and turned into electrical current which can be measured. The smoothness of the paper sample under test is determined if it is pressed against the back face and reduces the light intensity coming out.

Smooth papers make good contact and greatly lower the intensity, while rough coarse papers cannot make as good contact and dim the light less. The amount of electrical current generated in each case is thus a measure of the smoothness of the two papers.

The moon gives off no light of its own, but it reflects light from the sun which travels to the earth in a little over a minute.

Sponge rubber is being used like cement in tree surgery to fill cavities.

Silicosis, a lung disease contracted in dusty occupations, is called the greatest single occupational hazard in this country.

A new farm machine invented in Russia is a beet harvester combine that pulls up beet roots and removes the earth and leaves clinging to them.

Red or yellow ocher mixed with road surface material is a new safety idea, because the ocher makes the road somewhat luminous at night.

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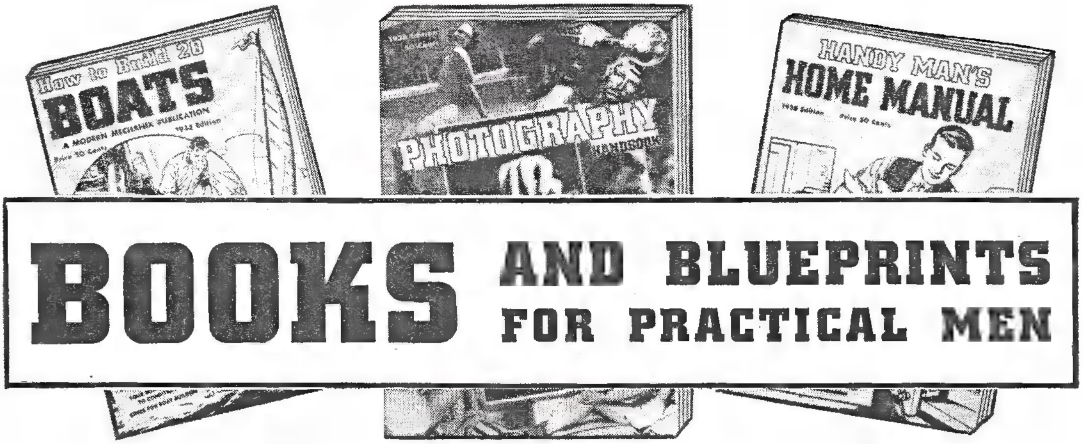

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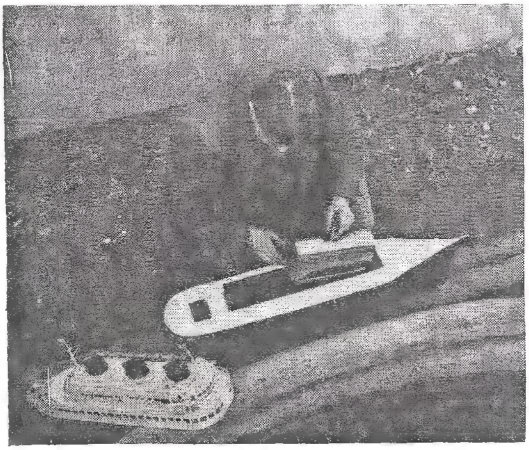

A model of the transoceanic liner *Normandie,* which is powered by a small steam engine, was recently constructed by Henri Devoize, of Paris, France. The engine is removable, the superstructure of the model being so designed that it clamps into position on the hull. When running, the smoke from the steam engine pours from one of the model liner's funnels, creating a very realistic appearance. The model weighs 30 pounds completely equipped.

Invents Practice Ray Gun

A practice machine gun that sounds, and even jams like the real article and, in fact, does about everything but fire bullets has been patented (No. 2,069,750) by Capt. Charles H. Coates, of the U. S. Army, stationed at Vancouver, Wash.

Moreover, the practice gun gives a visual appearance to the operator, of firing actual bursts of bullets. This it does by "shooting" a cone of light rays at the target instead of bullets. By observing where the light rays strike and light up the target, the gunner knows whether he has made a hit.

Captain Coates' practice machine gun has as its nucleus a real machine gun. To such a gun, he attaches a long bar under the gun barrel in parallel arrangement with the axis of the bore. The outward tip of the bar carries a focussing lens.

To shoot, first the gunner sights the gun on the target, then pulls the trigger. This closes a switch on the trigger. A flashlight goes on, the lens catches its light and sends rays streaming toward the target. Simultaneously a clapper sounds out a "rat-tat-tat." By pulling and releasing the trigger, the operator controls the length of the bursts of light "bullets."

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Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is automatically increased yearly to $2,450. Advance may be had to Chief Clerk at $2,700 a year. ($112.50 each pay day.)

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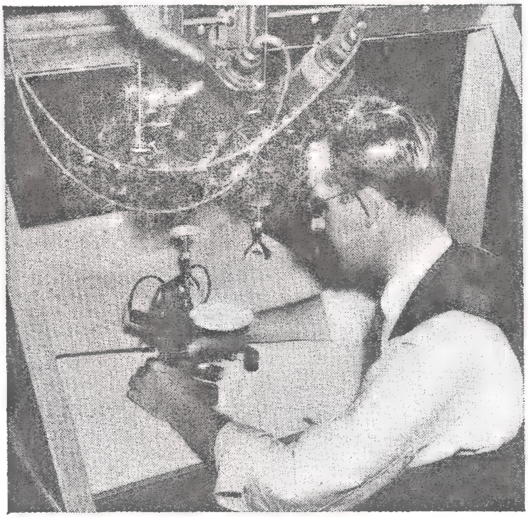
Stereoscopic Projector Aids In Making Of Aerial Maps



Aerial mapping is now reaching a stage of accuracy and speed which is destined to relieve the surveyor, with his transit and theodolite, of much of his roughest work. Jobs that would have taken him weeks can now be accomplished in a few hours by the use of a plane, a camera, and a new stereomapping projector which has been developed by a well known optical firm in Rochester, N. Y.

An automatic camera in the plane, shooting at regular intervals, makes pictures a mile apart. Terrain features are thus seen from different positions in succeeding photos just as the two eyes, seeing things from slightly different positions, get depth perception. If the two eyes respectively see the views taken a mile apart, the effect is as if the mapmaker had eyes a mile apart.

To achieve this, the 7"x9" film negatives, each covering from the usual altitude of 20,000 feet, about 13 square miles, are printed on small glass plates about the size of two special delivery stamps. The utmost exactness is required in the adjustment of the instruments since a difference of one ten-thousandth of an inch might mean a difference of feet in the field. From the glass plates the picture is projected down on a drafting table by two adjacent projectors operating in red and blue light respectively.

With six separate adjustments on each projector set to produce exactly the same angular position that the camera occupied when making the corresponding negative, the mapper, wearing spectacles with one red and one blue lens, suddenly sees a single illusory three-dimensional model of the terrain on the table before him. The effect is so realistic that he may feel an impulse to pat the top of a smooth hill or prick his finger on a telephone pole.

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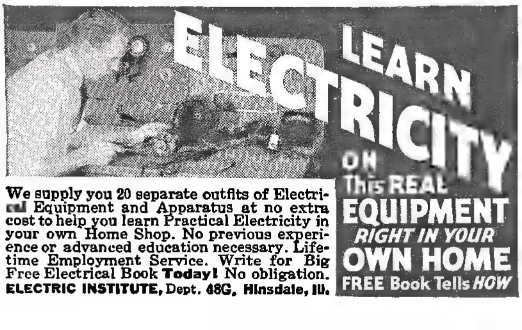

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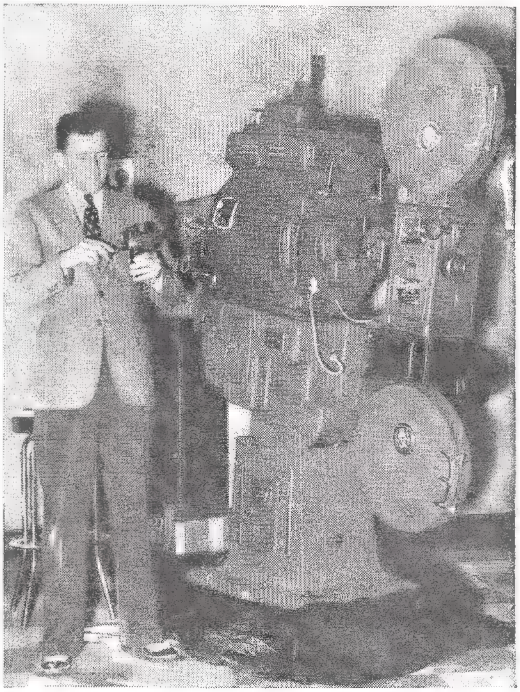
Old And New In Projectors



The great advances which have been made in the design and construction of motion picture projectors is shown in the photograph above. B. A. Cawthorn, a projectionist in a theater in Jacksonville, Florida, is holding an 1890 model projection machine which was capable of handling about 100 feet of film and boasted a small acetylene lamp as a light source. The huge modern projector shown in the photo has a 7000-watt light source and handles about 3000 feet of film.

Clipper Airplanes Can Make Full-Speed Turns On Water

A sober picture of the performance characteristics of the giant transoceanic clipper flying boats that have excited the admiration of the entire world was presented to the national aeronautic meeting of the Society of Automotive Engineers held in Washington, D. C., by William K. Ebel, engineer of the Glenn L. Martin Company, builders of the Pacific and Soviet clippers.

The great metal birds can figuratively turn on a dime even when taxying at high speed preparatory to taking off, Mr. Ebel told his audience. Should an obstruction appear on the water lane down which the boat is roaring for the take-off, the pilot can cut two motors on one side and swing his rudder at the same time, taking the boat quickly and safely out of harm's way.

IN THE JULY ISSUE OF MECHANIX ILLUSTRATED

SMALL DIESELS—NEXT BOOM INDUSTRY—A leading Detroit manufacturer is preparing to spend several millions on new factories, new machines, new tools and ideas for the mass production of small size Diesel engines for many applications in the home, the shop and the farm. Almost overnight a boom industry is developing, and is creating many opportunities for men versed in various phases of Diesel design, construction, sales and maintenance.

NO MORE MOTOR FEVER—Car owners spend time and money preparing their cars for winter driving, but neglect to condition them for hot weather driving. This authoritative article contains many helpful and valuable suggestions that every driver can read and profit.

METAL LUNGS GIVE LIFE—Many a potential victim of infantile paralysis has been saved from painful suffocation by artificial respirators, popularly known as "iron lungs." Do you know how they work? This interesting article tells (literally) the inside story.

Don't forget that MECHANIX ILLUSTRATED runs the largest and best Photography Department in print! The July issue will have 15 pages of practical, useful data for all camera owners, including the following articles: "What the F. Numbers Mean;" "Close-Up Camera Takes Big Pictures;" "Toy Motor Makes Tank Agitator;" "Simple Developing Rack;" and many ingenious kinks and short cuts.

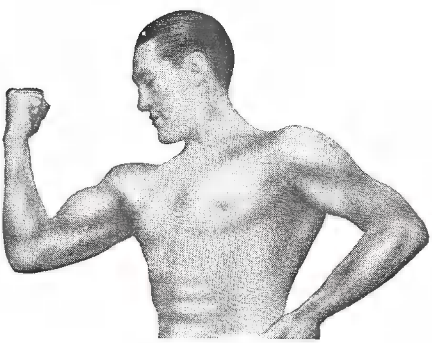
Also in the July issue: hobby, craft and shop projects; auto, household, shop and camp kinks; boat and model airplane plans. Don't miss this big 15 cent magazine, on sale at all newsstands!

College Physicists Achieve Levitation Scientifically

Real levitation has been achieved at the University of Virginia, but not by supernatural means or for purposes usually associated with the word. Dr. F. T. Holmes and Prof. J. W. Beams of the physics department spin a rotor 1,200 times a second as it is suspended in a vacuum in their researches. A clever balancing of the downward thrust of gravitation by an upward thrust of magnetic forces is the way the levitation is accomplished.

So free from friction is this type of suspension that once the rotor gains its top speeds it decelerates at the rate of only one revolution per second, in a time of eight minutes. This means that if the balancing forces were applied continuously it would take six and two-third days for the rotor to come to a stop once it attained its velocity of 1,200 revolutions a second.

Powerful centrifugal forces are created in the rotor which finally tear it apart; in fact the upper limit of speed is limited only by the strength of the material in the rotor.



TOMMY LOUGHRAN
Undefeated World Champion. *Photo taken Feb., 1938*

STOP
Kidding the Undertaker

When you jump out of bed in the morning, are you all pepped up and raring to go? Do you walk down the street with a spring to your step and a feeling of real buoyancy to your whole body? If you don't, you are only kidding the undertaker. You are half dead—but you don't know it.

WAKE UP AND LIVE

Come on! Snap out of it! You were meant to be strong. Yes, your whole body was meant to be covered with muscles and bubbling over with vitality and power. Don't tell me you're different. Any man or boy that makes up his mind to have a powerful physique can get it. And that's not all.

A NEW LIFE

If you only knew the joys of a strong, virile body, you would not let another day pass without striving to attain it. It not only means broad shoulders and massive arms. It means a deep, full chest inhaling life-giving oxygen. This helps to purify your blood and shoots life and vitality throughout your whole system. It gives a sparkle to the eye and a clear thinking brain. It sends a tingle into every minute part of your body. You will fear nothing nor anybody. You will feel like shouting: "Come on—bring on those wild cats!"

CHOOSE YOUR TEACHER

Don't leave as an important a task as this to just anyone. Don't think just any kind of muscle will do. This is a scientific job and needs a capable instructor. I am not boasting when I claim I can turn the trick for you and do it right. A world champion should know what he is talking about. As a kid, I was a pitiful weakling, but I made up my mind to find out how this thing could be done. It cost me piles of money and many years of constant research. You can skip all this. What I have learned I am now ready to pass on to you.

Send for My FREE Book "Puissant Body Building"

This contains numerous photos of the athletes and strong men I have trained. It will be an impetus and an inspiration to you. I don't ask you to buy it. I want to spread the glad news. It is absolutely *free*. Yours to keep.

Don't delay. This does not obligate you in any way whatever. It is merely an inspirational talk and will show what I have done for so many others.

ACT TO-DAY

Do you wish these mighty muscles for yourself? Write at once and I will tell you how you can possess them. You will feel the thrill of a new life pulsing through your veins—you will shout to the world "I'm a man and I can prove it."

FREE

For the next thirty days I will send you with my free book, a beautiful reproduction of my portrait, made by a famous artist. Only those who send for my booklet will have this autographed reproduction.

TOMMY LOUGHRAN
Dept. 55, 4 So. 15th Street, Philadelphia, Pa.

TOMMY LOUGHRAN, Dept. 55
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LEJAY MFG. CO, 1314 LeJay Bldg., Minneapolis, Minn.

Gas Engine Drives Tiny Pump

Easily carried by one man, this portable self-priming centrifugal 3-inch pump has an hourly capacity of 15,000 gallons with a guaranteed suction lift of 28 feet. It is built to handle muddy water with solids. This unusual pump weighs but 93 pounds, complete with a built-in air-cooled gasoline engine. A high-tension waterproof magneto shoots a hot spark and makes starting easy. The pump is sturdy and weatherproof and it will not overheat or freeze. The principal parts are made of a special abrasion-resistant aluminum alloy which weighs but 1/3 as much as cast iron. It is economical—1 gallon of gas pumps 35,000 gallons of water. It can be compactly stored in a contractor's tool box or carried in an automobile. Its easy portability puts the pump on the job, pumps out the hole, and permits the men to start working before large pumps could be moved to the job and be set up, thus speeding construction.

This pump will be found especially useful for pumping out cellars in areas troubled with spring floods.

Preserved Brain Specimens Exhibited In Museum

PORTIONS of actual human brains, so treated that they will remain in the same state of preservation indefinitely, have been placed on exhibition at the New York Museum of Science and Industry in Rockefeller Center in New York, N. Y., as the latest example of what the development of modern plastics means to scientific progress and resulting gain to modern life.

There are six specimens in the collection on view at the Museum, two of them showing sections of the normal brain, two presenting different views of cerebral hemorrhage, one showing a condition of brain tumor and one a tumor of the pituitary gland. In appearance, they resemble slices of petrified wood, and while they would probably break if dropped or given a sharp blow, ordinary conditions of handling cannot harm them or affect their characteristics in any way. This remarkable state of preservation, brought about by soaking the brain in a solution containing a powdered resinoid substance, makes these specimens ideal for use in medical schools, research laboratories, and all other places where such tools of work are required. Recent experiments have demonstrated that other human organs can be treated in the same way with equal success.

Wheels Test Road Material

The popular belief that you never get anywhere going around in circles is being disproved at the Arlington testing laboratories of the U. S. Bureau of Public Roads, where two automobile wheels rotating on the surface of a small circular track are revealing the relative stabilities of various low-cost road surfaces. There are two of these apparatus, one indoors and the other out, with five or six sections of different bituminous mixtures making up the surface over which the wheels rotate.

Tests are made of one variable factor at a time, such as the quantity or the consistency of the bituminous mixture, and are run until the relative wear on each section reveals the comparative stabilities which result with regard to the several circumstances of the variable. The wheels, which exert a force of 80 pounds on the road surface, are mounted on the ends of a centrally pivoted steel beam which can be driven at three speeds, the maximum being 9 miles per hour.

The track itself, laid in a concrete trough, is approximately 37 feet in circumference, 18 inches wide, and has a mean depth of 12½ inches. Distribution of the "traffic" over the width of the surface during compaction is made possible by shifting the pivotal point of the steel beam back and forth by means of a hand-operated wheel.

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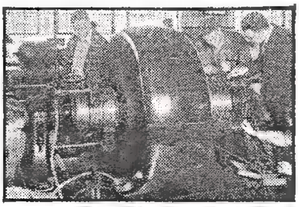

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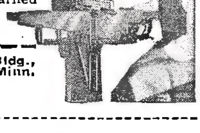

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Dept. A-235 Chicago, Ill.

Radio Filter Helps Pilots Get Weather, Range Signals

A new radio filtering device which permits airplane pilots to receive either, or both, radio range signals or weather reports has been developed by the Western Electric Company.

A three-position switch permits reception of both radio range beacon signals and weather reports. Turn the switch one way and only the beacon signals come through. Turn it the other and only the weather reports are received.

Purpose of the device is to permit pilots to hear either beacon or weather which are now, under new regulation, both broadcast simultaneously. This twin broadcasting is an improvement on the old method which made it necessary to shut down beacon signal transmission when weather reports were given.

Justified complaints were received from pilots trying to follow beacons in bad weather when the beacons were turned on, even for only short intervals. It did these pilots little good to be told that it was foggy right down to the ground, when they were flying blind already. What they wanted, and have received by the new system, is continuous operation of the beacons at all times.

Selective reception of the twin radio airline signals is accomplished in the new instrument by blocking out a narrow band of frequencies from the much broader band that carries the human voice. This narrow band carries the dots and dashes of the range beacons.

Removal of the narrow beacon frequencies from the voice transmission distorts the signals slightly from normal but does not interfere with intelligibility of the speech.

The elimination of the voice on the beacon signals is said to improve their reception greatly since the noise-to-signal sound level is markedly decreased and the signal is better received.

Spectroscope Helps Experts Build Better Guns

Uncle Sam is using the keen eye of the spectroscope, science's powerful research tool, to make sure he gets the best grade steel for his guns, according to Major J. L. Guion, who, in an address at Massachusetts Institute of Technology, at Cambridge, Mass., explained how the instrument has replaced chemical analyses in the Army's efforts to detect impurities.

Particularly, the spectroscope has been used to test steel for molybdenum and vanadium, metals often found associated with steel. The best steel for guns or armor-plate has from four to six parts in 1,000 of molybdenum and one or two parts in 1,000 of vanadium. More than this, or even less, makes the metal brittle and liable to crack under pressure of repeated explosions.

Hospital Has "Blood Bank"

A hospital in Los Angeles, California, is equipped with a specially designed refrigerator which serves as a "blood bank," storing quantities of human blood for later use in cases requiring blood transfusions. The "blood bank" is expected to save more than $10,000 annually and eliminate delays in operations. The refrigerator is kept at a temperature of four degrees above freezing, an alarm being automatically sounded when the temperature varies. The blood is kept on hand not longer than two weeks, a fresh supply being secured at regular intervals.

New Type Electromagnet Built Like Jelly Roll

An electromagnet, believed new in construction principles, is reported by Harvey Allison of Bridgeport, Conn. Known as the "roll" magnet it consists only of iron or steel and insulating varnish.

To make one you use the technique of the housewife for making a jelly roll. Remember, she cuts the dough in a long strip and rolls it up into a cylinder. Mr. Allison's invention has iron "dough" and insulation for the "jelly."

Mr. Allison makes his roll magnet out of a strip of thin sheet steel, four inches wide, four one-thousandths of an inch thick and fifty feet long. He simply rolls the strip compactly and putting electrical connections at each end, passes current through it.

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"5 MILES MORE per Gallon" says F.L.Van Ness

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Islands Float on Florida Lake

Nic Sprank Offers $5.00 For Best Oddity

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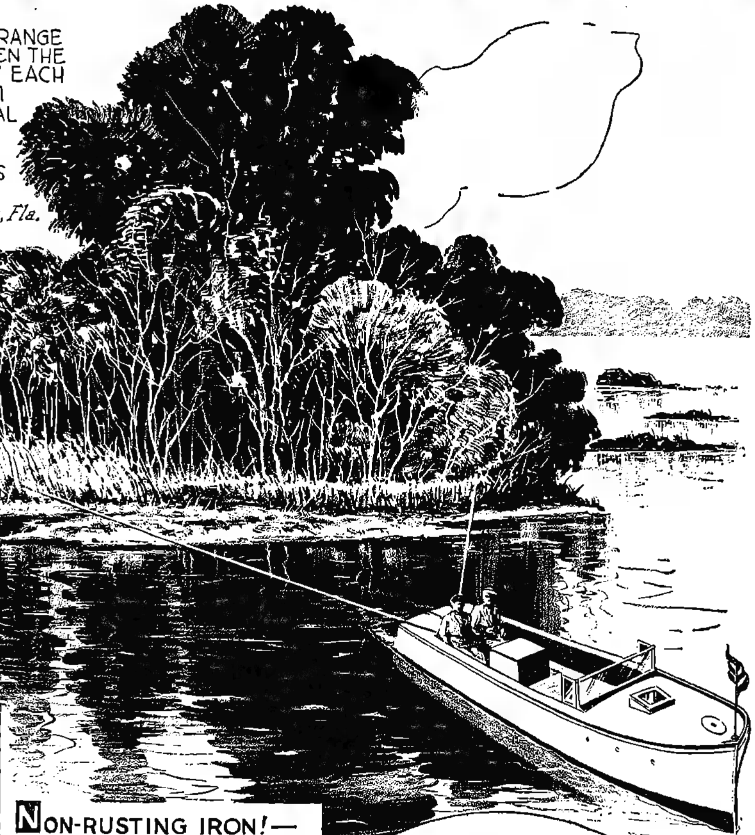
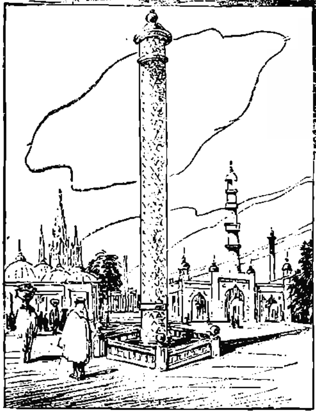
W. W. Patterson, Jacksonville Beach, Fla.

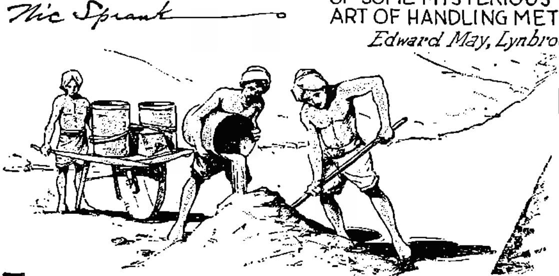




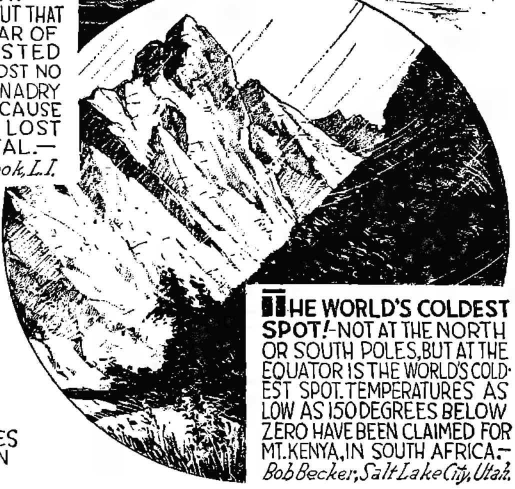
Nic Sprank

NON-RUSTING IRON!— A CHEMIST POINTS OUT THAT THE FAMOUS IRON PILLAR OF DELHI, INDIA, HAS LASTED 1,600 YEARS WITH ALMOST NO RUSTING BECAUSE IT IS IN A DRY CLIMATE, AND NOT BECAUSE OF SOME MYSTERIOUS LOST ART OF HANDLING METAL.—

Edward May, Lynbrook, L.I.



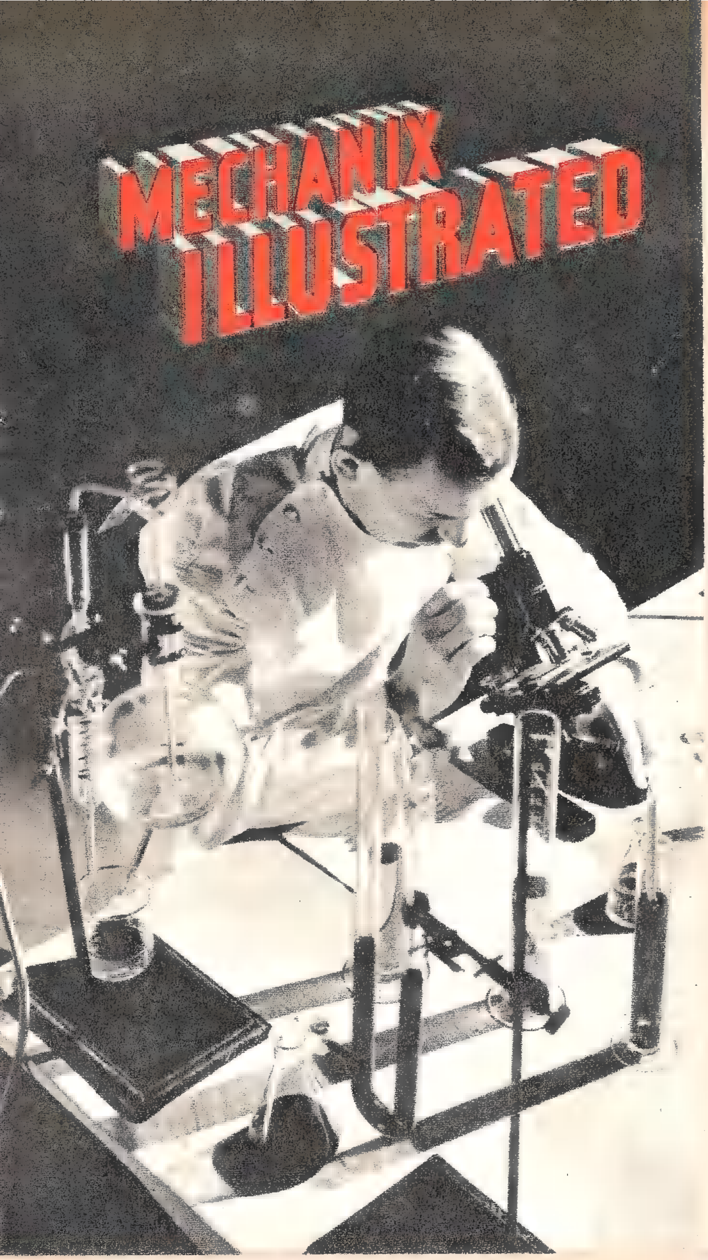
MOLASSES ROADS!—THE STATE OF MYSORE, INDIA, BUILDS ROADS SURFACED WITH A MIXTURE OF MOLASSES AND DIRT. THIS MIXTURE SHEDS RAIN AND KEEPS DOWN DUST.—*J. H. Spicer, Owen Sound, Ont., Canada.*



THE WORLD'S COLDEST SPOT!-NOT AT THE NORTH OR SOUTH POLES, BUT AT THE EQUATOR IS THE WORLD'S COLDEST SPOT. TEMPERATURES AS LOW AS 150 DEGREES BELOW ZERO HAVE BEEN CLAIMED FOR MT. KENYA, IN SOUTH AFRICA.-

Bob Becker, Salt Lake City, Utah.

Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Editorial Office, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.



Vol. XX June
No. 2 1938
W. H. FAWCETT
Publisher

SCIENCE IS KING!

"Men who made civilization what it is today were not famous statesmen, conquerors or philosophers. They were—and are—men engaged in the mechanical sciences."

BY LOWELL THOMAS

OVER the airwaves comes a desperate appeal to the radio station at Nome. "For God's sake, send help, if you can. We're starving and dying. There's an epidemic. Almost everybody is flat in bed."

"What do you need? Food?"

"Food, yes, and milk. But above all, serum. This whole settlement will be wiped out if we don't get serum."

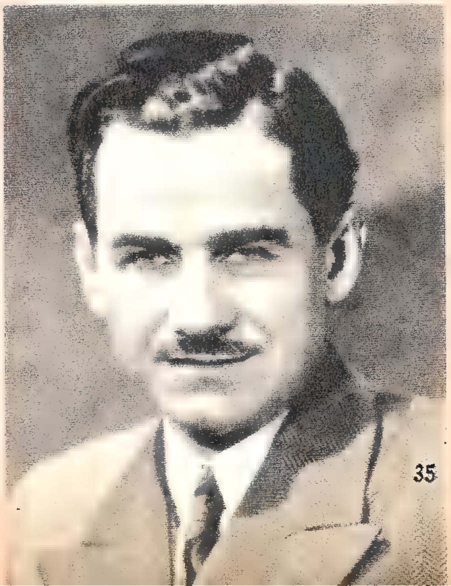
By dog-sled and man-power it would take two weeks and a lot of luck to carry the needed supplies to that stricken community. But there is Joe Crosson with his plane. Can he make it? The problem is put up to him.

"We'll do our durndest," he replies, speaking for himself and plane.

We won't go in to the trouble and danger he goes through. For one thing, it's an old story to Joe Crosson. He has done it before probably will have to do it again several times. The point at this moment is that he does it. An entire settlement in the frozen North is saved from extinction.

Such an episode, not uncommon in these days, serves here to

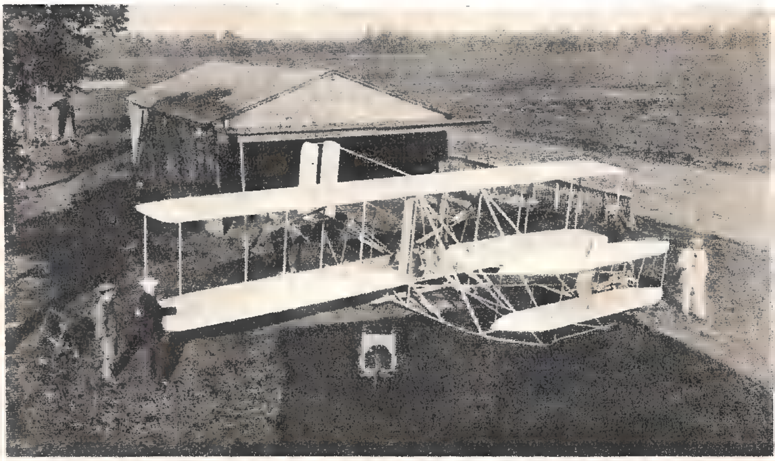
The great debt which the modern world owes to the man in the laboratory and the man in the workshop is brilliantly discussed in this article by Lowell Thomas, internationally famous radio commentator and author, below.



dramatize the crescendo advance of civilization. I believe everybody agrees that one of the two highest functions of this civilization of ours is to diminish disease. A generation ago the saving of that Arctic settlement would have been impossible.

To whom did those stricken people owe their lives? All honor to Crosson. He did his errand of mercy with courage, fortitude and skill. But without the work that a number of men did before him, some in factory and machine shop, some in chemical laboratory, some in astronomical observatory, all of Joe's courage and fortitude would have been unavailing and there would have been no call for his skill. No call for help could have been flashed through the air if the physicist Hertz had not discovered the uncanny properties of the waves named after him and if Marconi—who was not educated as a physicist to begin with—had not, later on, developed the means of using those waves and thus made it possible for us to communicate from anywhere to anywhere else without the aid of wires. Crosson could never have flown to the rescue of that settlement but for the experiments of a couple of bicycle mechanics named Wright in Dayton, Ohio. Going back a bit, Wilbur and Orville Wright never could have made their strange machine fly if Gottlieb Daimler had not produced the gasoline engine. And Joe could not have navigated his airship but for the contributions of Copernicus, Galileo and Kepler, the great trio who may safely be called the fathers of modern astronomy. Finally, would he have had any serum to stop that epidemic if Edward Jenner had not introduced vaccination and thus become the originator of serumtherapy?

From all this, it seems to me, one fact emerges clear. The men who have made civilization what it is were not the famous statesmen, conquerors or even the philosophers. They were—and are—the men engaged in the mechanical sciences. Do you object that I have included a physician amongst them? Then I refer you to Arthur Keith's "The Engines of the Human Body" or Dr. Crile's brilliant work on "Man as an Adaptive Mechanism." Or watch a skillful surgeon at work. You will see that he is actually a super-mechanic plus, of course, a complete knowledge of the human anatomy. Again, it is generally conceded that William Harvey was the father of modern medicine. Consider his great discovery, the circulation

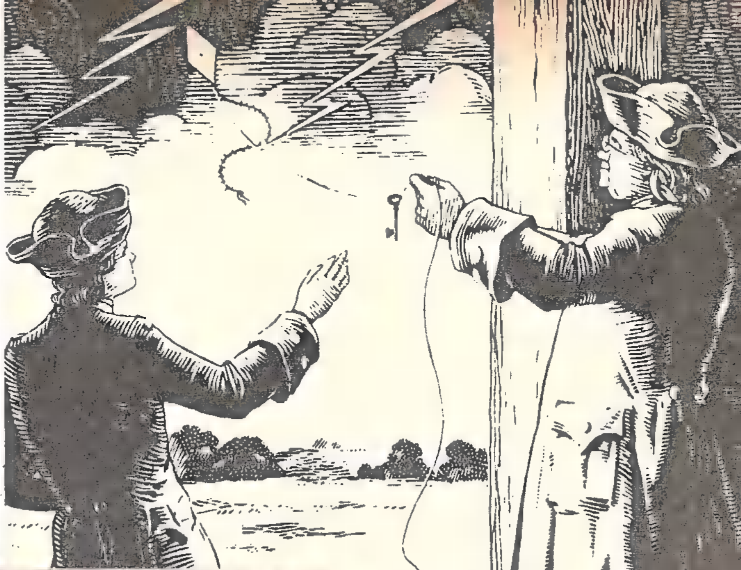


The heroic flight of Joe Crosson (above) which saved hundreds of lives, and the huge modern Sikorsky Clipper Ship (right) were both made possible by the pioneering experiments of the Wright Brothers, one of whose early planes is shown in the picture above, right.

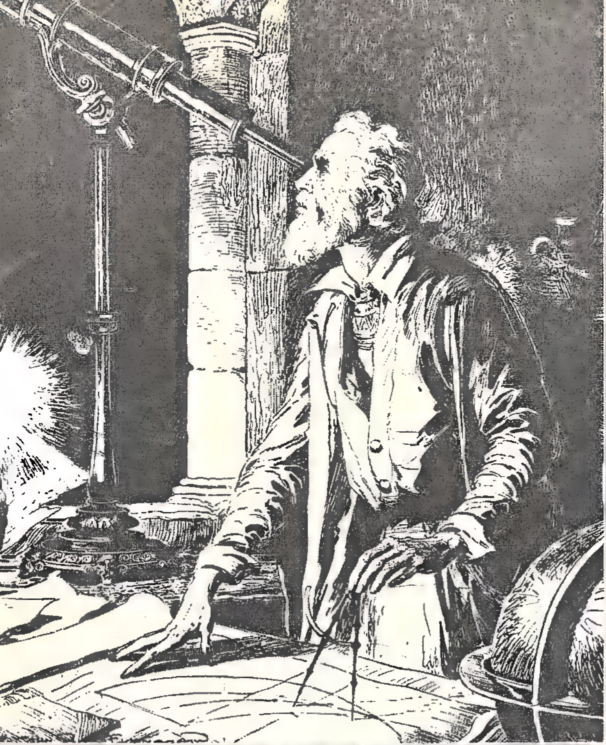
of the blood. It was the first true explanation of the mechanics of the life-stream. Upon it has depended every advance that we have made in the prevention and cure of disease.

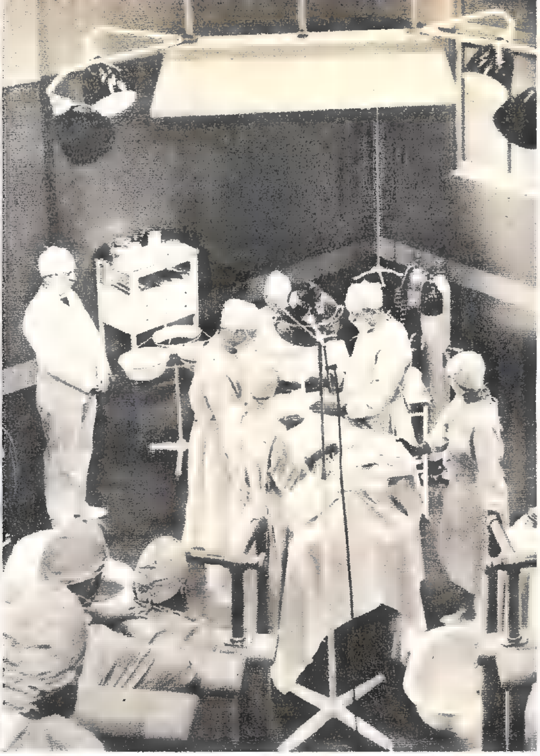
The fact that I have stated above will not go undisputed. The highbrows will say: "To the pillory with him! He blasphemes the memory of the great philosophers." Whereupon it occurs to me that I have heard scholars remark that, actually, philosophy has not advanced a single step in any important direction. There have been different systems of philosophy, true, but admittedly none greater than that of the ancient Greeks. And, frankly, I am one of those who are convinced that neither Schopenhauer nor Kant nor Spinoza nor Descartes nor even Papa Plato himself has contributed one jot or tittle towards the saving of a single human life, the curing of a sick child, the alleviation of poverty.

And what of the great conquerors? I can think of only one or two whose achievements had any lasting and *beneficent*

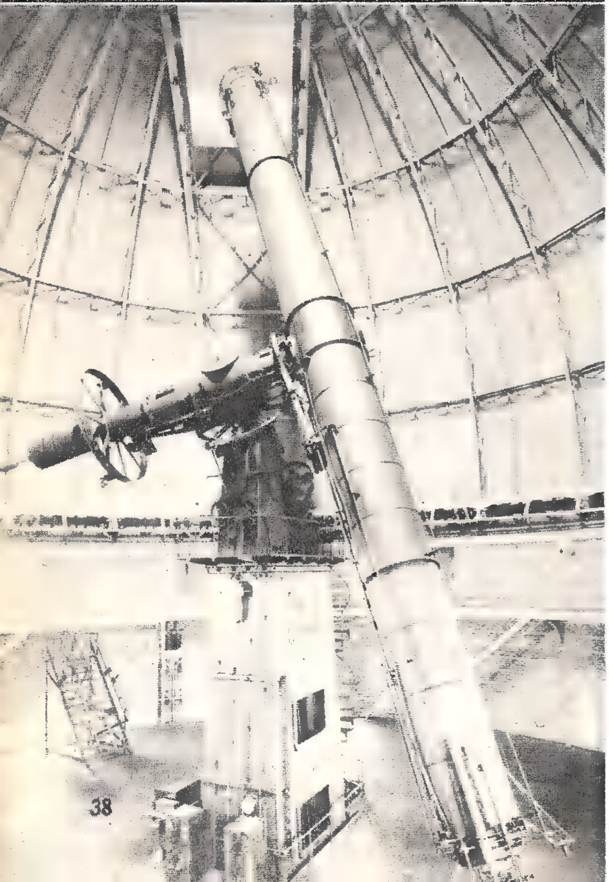


Benjamin Franklin (above) first tempted [illegible] spark from the skies; today Dr. Robert J. Van de Graaf, of the Massachusetts Institute of Technology, creates 7,000,000 volts of artificial lighting with the man-made apparatus shown at left.





The marvels of the heavens which the 20-ton telescope (below) of the Yerkes Observatory reveals were first accurately scanned by Galileo (above) with his crude instruments, in the 17th Century. Even modern surgery, above right, depends for its achievements largely on mechanical principles.



effect. Alexander spread the culture of Europe, such as it was, through Asia and brought back some of Asia's lore to Europe. But his work, like that of even Julius and Augustus Caesar, has left but few traces. "That which is done violently always has to be done over again." Caesar, Hannibal, Hammurabi, Genghis Khan, Charlemagne, Napoleon Bonaparte—you can have the whole lot of them, for what do we owe them? I recall a line in "Man and Superman" by Shaw: "Commander, when the soldier approaches, Mankind hides away his women and buries his forks and spoons."

Statesmen? Most of them have been parasites on the soldier's back. The best that can be said about them is that the more intelligent have protected and encouraged the experts in the mechanical sciences. But usually the scientists had to obtain this protection by dint of their capacity for destroying human life, not saving it. Archimedes, discoverer of the lever and the greatest of Greek scientists, was employed by the Tyrant of Syracuse because he invented artillery engines. Leonardo da Vinci, one of the greatest minds of all time, sought the favor of princes not because he was the foremost of Italian artists, a poet and mechanical genius but because he was a brilliant military engineer!

As this is being written I can think of just two statesmen who contributed something imperishable towards civilization. And in

[*Continued on page* 134]

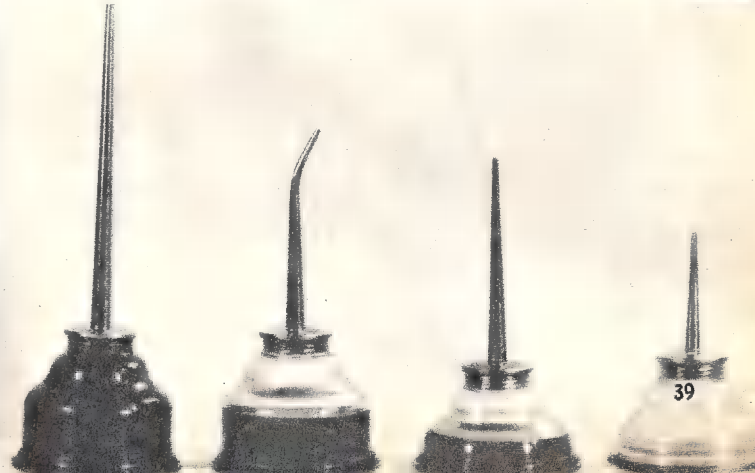
Cooking Pot Has Clamping Lid

A NEWLY developed aluminum cooking pot features a clamping lid which can be instantly released by pressing down on a special trigger. An adjustable air vent in the lid takes care of the pressure created within the pot while cooking.

Two-Way Wrench Opens Tight Jars

THE annoying matter of attempting to pry the cover of a jar loose by prying it with a knife or placing the jar in hot water is said to be eliminated through the use of a recently patented two-way jar wrench. The device, which is made of stainless steel, features a series of various sized rings designed to fit the caps found on the majority of jars in which fruits, jellies, etc., are packed. The wrench is easy to use, the proper ring merely being slipped around the jar top and the two sides of the wrench handle then pressed together while an anti-clockwise motion is applied. It is only the work of a moment to select the proper ring for the jar at hand.

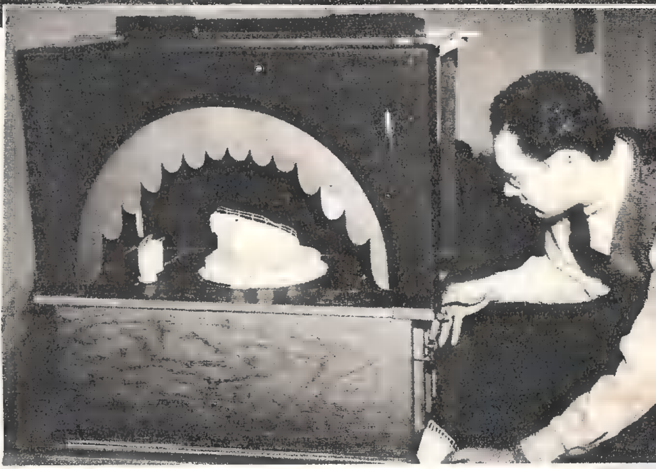
Transparent Oil Cans Developed



WEIGHING one-third less than metal types and unaffected by oils, gasoline or their derivatives, oil cans made of transparent plastic material eliminate the usual messy preliminary quirt to see if they are filled. The transparent cans are fitted with metal spouts.

SETTING THE WORLD'S LARGEST STAGE

Above—When the curtain rises [illegible] Radio City Music Hall in New York, N. Y., the audience [illegible] completed and colorful setting, but few of the theater's 150,000 weekly patrons realize the planning and work involved in making the sets.



Every set planned for the Music Hall's mammoth stage is first worked out in detail [illegible] a miniature stage (above), which has three elevators and [illegible] turntable, enabling all technical problems to be solved at small expense before costly full-size sets are constructed.

In the model room (above), Nat Karson, art director of the Music Hall, looks over miniatures of settings used in previous productions. A model of every set is carefully stored.

At the left, Art Director Karson is shown making a watercolor sketch that will serve [illegible] guide for the theater technicians who fashion the huge settings for the Music Hall stage from canvas, wood, steel and paint.

JUST as important a task as getting the performers ready for one of the gay spectacles presented on the mammoth 144x80-foot stage of the famous Radio City Music Hall in New York, N. Y., is the enormous mechanical and artistic job of creating the settings which transform the bare stage into a wonderland of illusion.

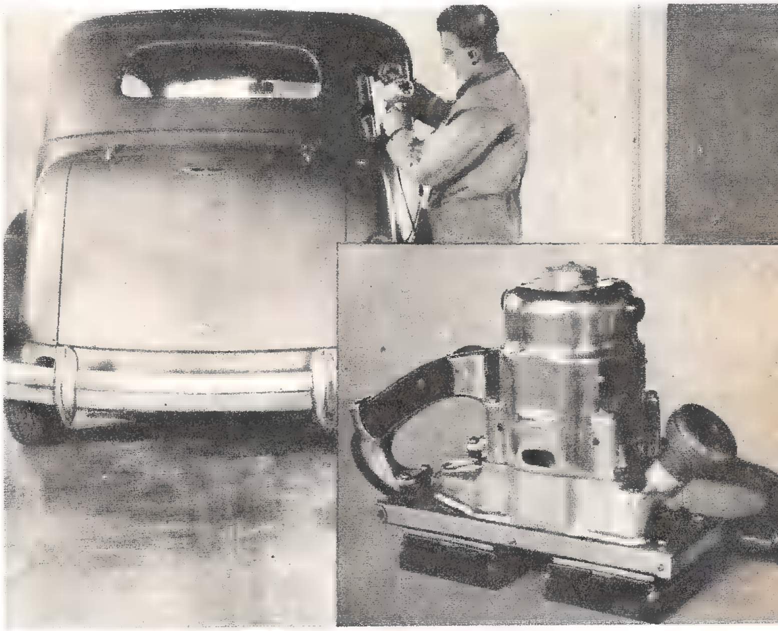
Every set planned for the huge stage is first worked out in miniature on a tiny stage which, like its prototype, is equipped with three elevators and a turntable so that the settings can be moved about just as on the real stage. The miniature sets are constructed from cardboards, celluloid, glue and pins, enabling all scenic effects to be carefully studied and changed before engaging in building of costly full-sized sets.

Device Measures Heat Of Skin

SCIENTISTS at the University of Illinois have devised an apparatus that measures changes in skin temperature caused by changing air conditions. The patient's feet are encased in boxes and a stream of cold air directed upon them while an electrical reading of skin temperature is taken.

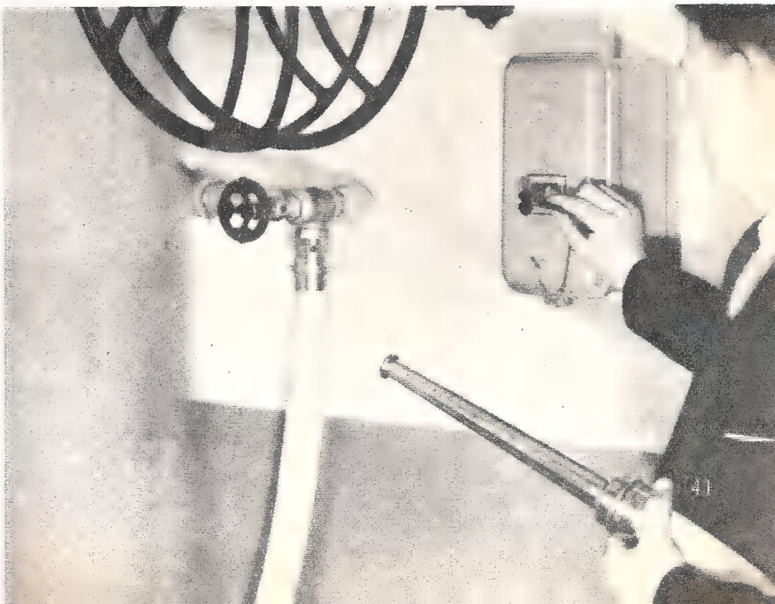
Electric Polisher Runs Dual Blocks

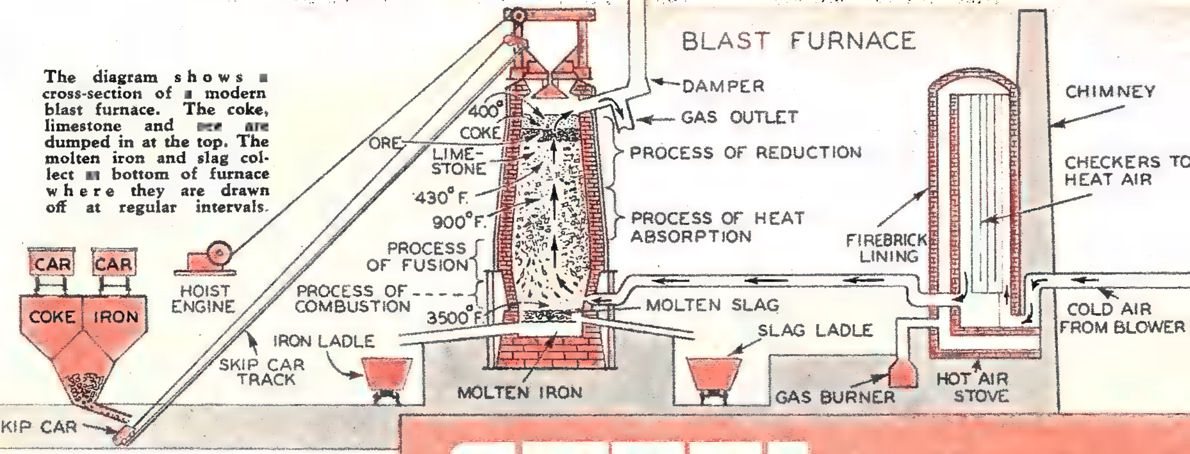
EMPLOYING two rubbing blocks simultaneously, a newly developed machine which sands, rubs and polishes can be plugged into any convenient electric current outlet. The dual block arrangement makes it especially useful for curved surfaces and inside corner work. The blocks are detachable and interchangeable and the machine is furnished with one set each of sponge rubber and felt blocks. The complete unit weighs only ten pounds and is easily handled.



Fire Piping Has Remote Control

FIRE protection piping is prevented from freezing or leaking by a new type of valve, which is of the remote control type and can be located some distance from the piping, where it is warm. No water is kept in the exposed section of piping, but it is available within a few seconds after the control is pressed.

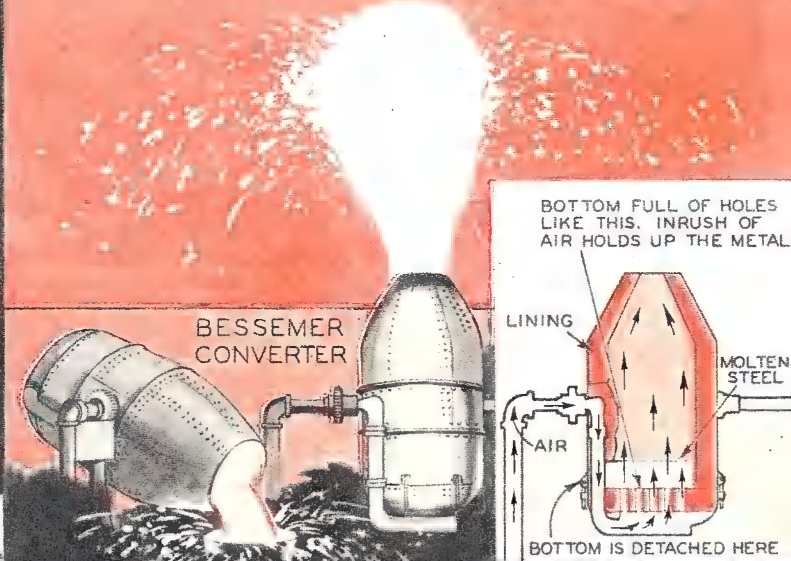



BLAST FURNACE
DAMPER
GAS OUTLET
PROCESS OF REDUCTION
PROCESS OF HEAT ABSORPTION
CHIMNEY
CHECKERS TO HEAT AIR
FIREBRICK LINING
400°
COKE
ORE
LIME-STONE
430° F.
900°F.
PROCESS OF FUSION
PROCESS OF COMBUSTION
3500°F.
MOLTEN SLAG
SLAG LADLE
MOLTEN IRON
IRON LADLE
CAR
CAR
COKE
IRON
HOIST ENGINE
SKIP CAR TRACK
KIP CAR
GAS BURNER
HOT AIR STOVE
COLD AIR FROM BLOWER

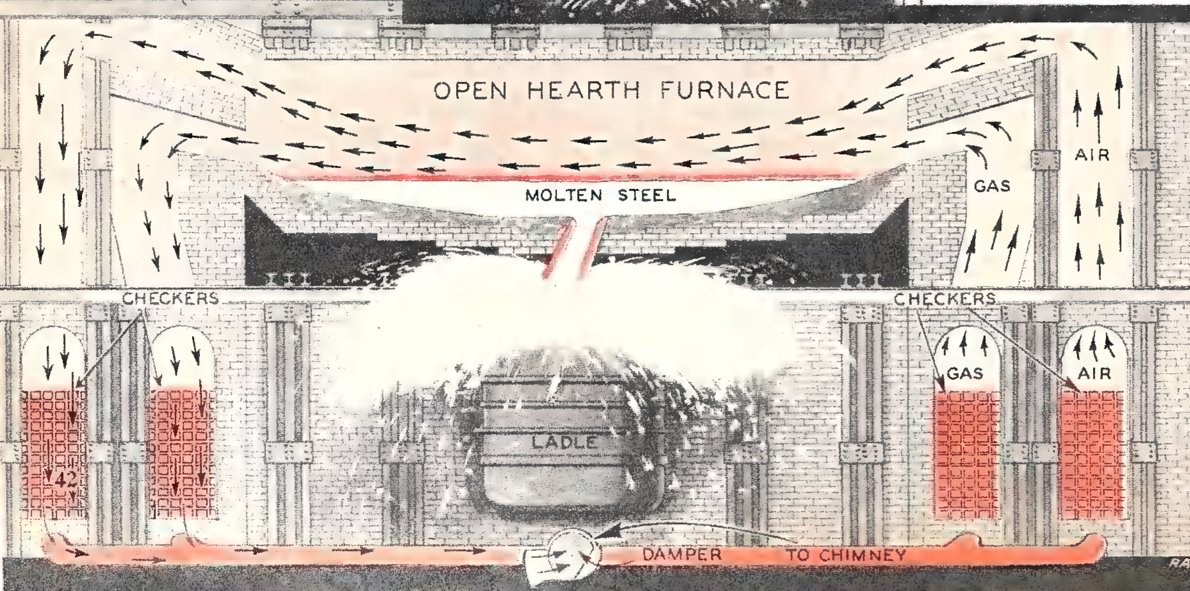
The diagram shows a cross-section of a modern blast furnace. The coke, limestone and ore are dumped in at the top. The molten iron and slag collect at bottom of furnace where they are drawn off at regular intervals.

STEEL—Backbone

At right is shown a cross-section of a Bessemer converter. It consists of a huge pear-shaped steel pot, lined with heat-resisting brick. In use, the converter is tilted on its side and filled with molten iron. Carbon and manganese are added to make the steel hard and elastic. When the converter is returned to an upright position, air is forced into the mixture from the bottom. After the fiery liquid is boiled for about twenty minutes, pure iron and manganese are added. Another boiling period and the white hot steel is poured off into a gigantic ladle.

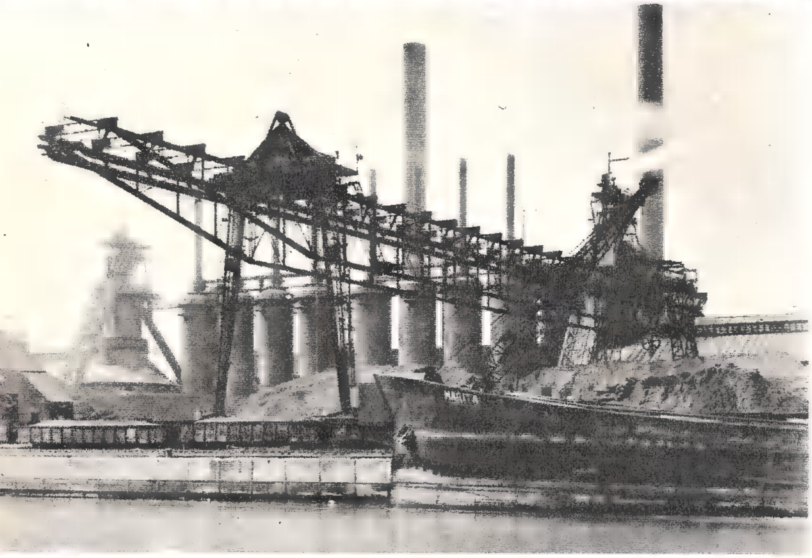

BESSEMER CONVERTER
BOTTOM FULL OF HOLES LIKE THIS. INRUSH OF AIR HOLDS UP THE METAL
LINING
MOLTEN STEEL
AIR
BOTTOM IS DETACHED HERE

Below — Open hearth furnaces today produce 91 per cent of the steel in the United States. Molten iron and other materials are placed on the clay and brick-lined hearth. Hot air and gas from a nearby oven blow over them. The molten steel is drawn off from furnace bottom.


OPEN HEARTH FURNACE
MOLTEN STEEL
AIR
GAS
CHECKERS
CHECKERS
GAS
AIR
LADLE
DAMPER
TO CHIMNEY

# of the Modern World

by Robert W. Gordon



A silhouette of a large steel mill. Bessemer converters emit tongues of fire which can be seen for miles at night. The color gradually changes from red to a yellowish white.

Left—Blast furnaces and ore docks at Cleveland, O. The blast furnaces are at the left and right. The round structures between are stoves which heat the air for the blast.

—Photos Courtesy Republic Steel Corporation

A WORLD without steel—try to imagine it! Without steel, the whole physical structure of the modern world would collapse. Lacking this one all-important substance, the civilization we know would cease to exist. There was, of course, civilization long before the discovery of steel, but it was vastly different from ours; so different that it requires an effort of the will to picture a world without steel.

Without steel—

There would be no buildings higher than walk-up distance; no airplanes, no automobiles, no modern railways or fast steamships.

Without steel—

Foodstuffs would be largely limited to what could be grown locally, and the threat of famine would be ever present. The horse and the sail would still be the principal means of transportation.

Without steel—

There would be no modern factories, industry, cutting tools, or power machines. Countless features of the twentieth century world would be non-existant. The United States would be back in the era of the horse and buggy.

The changes wrought by steel have been

A close-up view of a Bessemer converter in [illegible] night. In 1890, nearly 90 per cent of all steel was produced by this method.

Looking up toward the top of a blast furnace. The first step in the production of steel is the changing of the ore into molten iron. A modern blast furnace produces 600 tons a day.

Right — Stainless steel being polished. This is but one of the 500 different iron and steel products available today. Chromium added to steel prevents it from corroding.

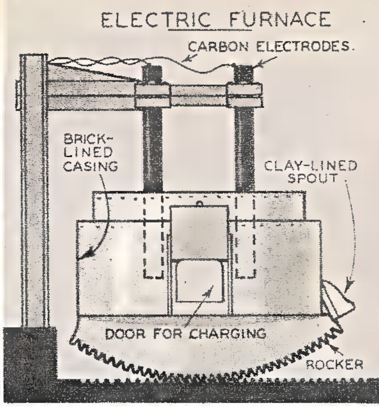
so vast and staggering that it is difficult to realize that the Steel Age is comparatively young. As recently as 1880, it was still gaining momentum. It wasn't in full swing until 1900, and its peak is not yet in sight.

Iron and steel were known before the Steel Age began. The first iron on record was placed in an Egyptian pyramid more than 5,000 years ago. The Romans used a lot of it, but with their methods of production a ton of raw iron would cost $1,000. Today the average price of finished steel is only $55 a ton. A medieval furnace could produce 100 to 150 tons of iron a year. A modern blast furnace produces 600 tons a day.

A hundred years ago a blast furnace consisted of a stack and a blower. Charcoal was the only fuel, and the bog ore was hand selected. The chief customers for the 25 or 30 tons produced a week were the nearby blacksmiths, who hammered out ferrous products by hand.

In those days the principal metals were cast and wrought iron. Cast iron was hard but brittle. Wrought iron resisted shock but was soft. Steel was needed, for steel is strong, wear-resisting, and tough. There was blister steel and crucible steel, but the methods of making them were slow and costly, and totally incapable of producing the metal in quantity.

Blister steel was produced by placing charcoal and wrought iron into clay boxes or



Stainless and heat resisting steel, and other high quality alloys are made in electric furnaces. These furnaces can produce and control accurately heat up to 3,800 degrees. Left—Charging a modern electric furnace.

jars, and heating for days, until the iron had absorbed enough carbon to become steel. Crucible steel was melted in a pot, along with carbon. The method gave us the famous Sheffield steels, excellent but rare and costly.

Ninety years ago Henry Bessemer of England and William Kelly of Kentucky, working independently, conceived the idea of refining iron by blowing air through it. Bessemer patented the process in 1855, but Kelly erected the first commercial converter two years later. The two interests merged in 1866, and became generally known as the Bessemer process.

A Bessemer converter is a huge, pear-shaped vessel made of steel plates and lined with heat-resisting brick. It is open at the top and mounted on hollow trunnions so it may be tilted. The base is perforated, so that air blown through the trunnions passes through these holes to bubble through the metal.

In operation the converter is tilted on its side and filled with from 10 to 25 tons of molten pig iron. The rush of air, turned on as the converter is returned to a vertical position, prevents the metal from running through the holes.

As the blast is turned on a brilliant shower of sparks bursts from the mouth of the converter, to be followed at once by short, ruddy flames, and a cloud of reddish fumes as the silicon and manganese combine with the oxygen and burn.

The ruddy flames gradually change to a yellowish white tongue of fire as the carbon in the iron burns; and for about ten minutes the sky is lighted up for miles, while the con-

Left—Small objects of jewelry made of stainless steel—An interesting modern development. Right—A modern kitchen using stainless steel.

A spectacular sight—tapping an open hearth furnace. An average heat is 90 tons and requires from ten to fourteen hours to make, depending upon the type of steel wanted.

verter emits a deep roar from the boiling mass of metal.

Suddenly the flame drops, and the converter is tilted again before the iron can burn. Ferro-manganese is added to the molten mass to absorb the gases and kill the boiling action. This ferro-alloy furnishes the metal with the desired proportions of carbon, sulphur, manganese, phosphorous and silicon, turning it into steel.

When the alloy has had time to do its work, the converter is tilted still further, and the molten mass is poured into a giant ladle from which it is teemed into ingot molds.

It was this Bessemer process of refining steel cheaply and in large amounts that introduced the Steel Age. In 1890 nearly 90 percent of all steel was produced by this process. Today open hearth furnaces produce 91 percent, with Bessemer a poor second at seven percent.

Bessemer steel, however, has certain definite advantages. Its high sulphur content makes it ideal for machining, for it cuts clean. It can be drawn into stiffer wire, and to finer sizes. It also makes the best welded pipe. Its low standing today is due to the demands for "tailor-made" metal, the manufacture of which can be controlled better in open hearth and electric furnaces.

The coming of the Bessemer process coincided with the fever of railroad building, and greatly accelerated it. Railroads paid $80 a ton for inferior iron rails in 1867, and could secure only 460,000 tons. They paid but $32 a ton for 1,500,000 tons of steel rails in 1884, the peak of railroad building.

With the growing demand for steel, it became necessary to produce raw iron in enormous quantities. Blast furnaces increased in size, until now one can turn out 600 tons of iron a day.

A blast furnace is an enormous steel shell, lined with heat-resisting brick, and often 100 feet high. Alternate layers of iron ore, coke and limestone are fed in at the top, while a blast of superheated air is blown in from the bottom. The coke burns in the hot oxygen, and the whole mass settles, the iron forming a molten pool in the bottom. The limestone also melts, absorbing the coke residue and earthy matter in the ore, and forming a molten slag that floats on the iron. The slag and iron are tapped several times a day, while the charge of raw materials is constantly renewed at the top of the furnace. A furnace will operate continuously, until shut down for repairs, or because there is no longer [illegible] demand for its product.

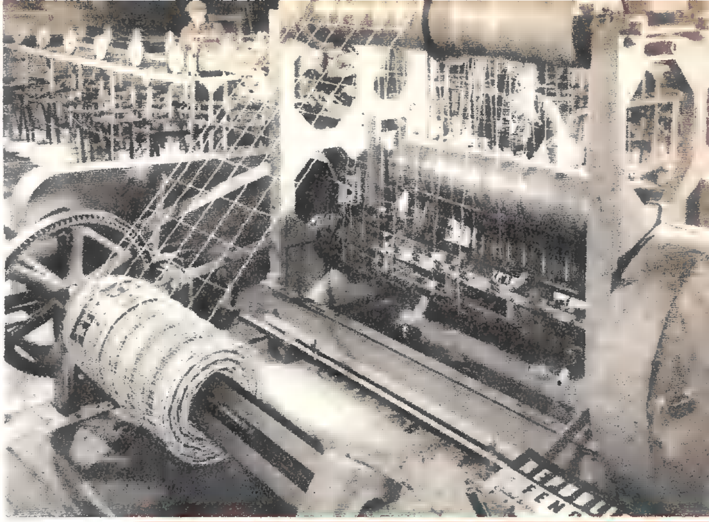
The tapped metal is cast into molds called pigs, unless it is to be used on the spot in the manufacture of steel, in which case it is taken in a ladle to a huge vat called [illegible] mixer, where it is kept in a molten state until needed.

The open hearth furnace was originally designed in 1864 to produce steel without infringing on the Bessemer patents. It was 20 years later before this type of furnace was operating on a commercial basis.

An open hearth furnace is a huge oven in which the hearth or floor is exposed to the sweep of the flames which melt the metal. The fuel, which may be gas, oil, tar or powdered coal, is blown in at one side of the furnace, along with heated air, through a checkerwork chamber of brick. The smoke and combustion gases pass off at the other side through [illegible] similar checker chamber. Every fifteen minutes or [illegible] the flow is reversed, so that the incoming fuel and air pass through a heated chamber. This reversal of flow conserves heat, and makes possible temperatures that could not otherwise be obtained without an enormous consumption of fuel.

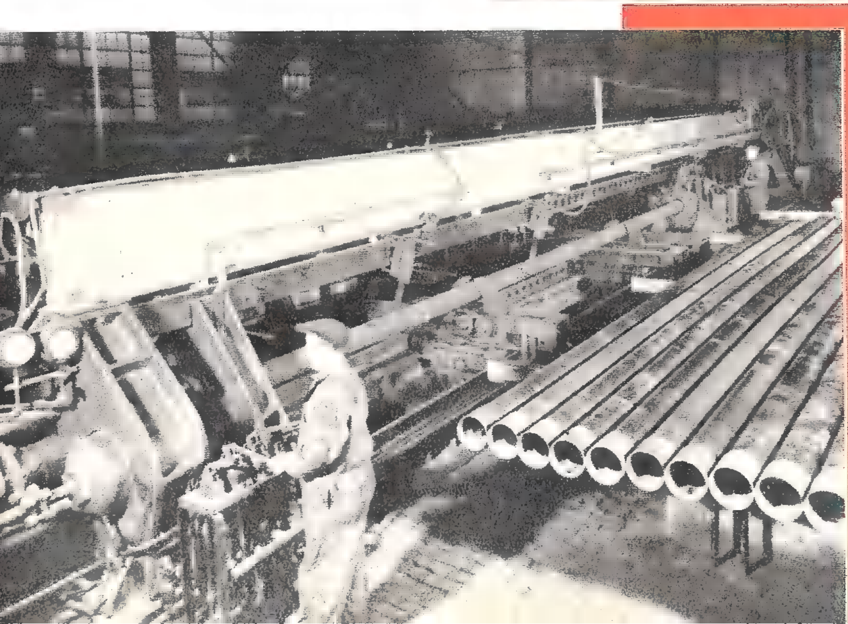
The open hearth may be charged

[*Continued on page* 149]

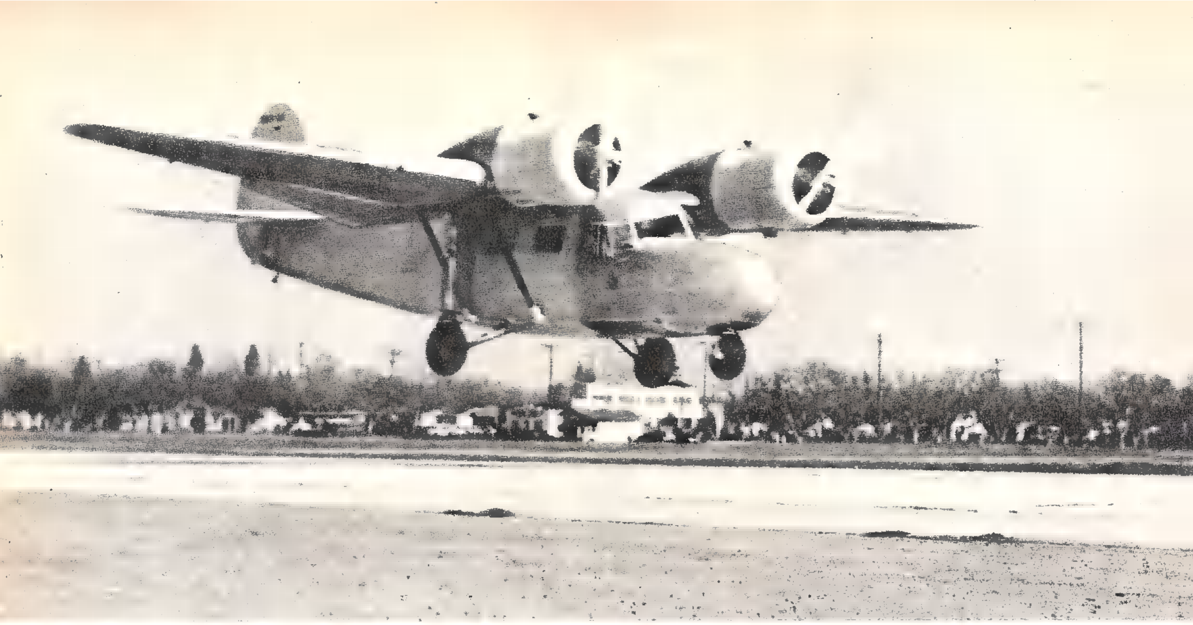


A wire fence making machine in operation. Wire fencing [illegible] but [illegible] of the countless products made possible by the modern steel industry.

When the bloom is made into bars it passes through sets of rolls several times, depending on the size and shape desired. Each time its [illegible] section is reduced and its length increased.

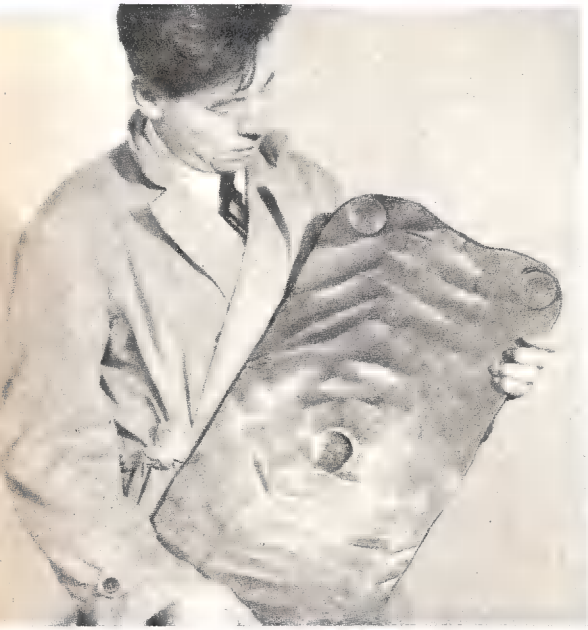


Left—Seamless steel pipe is tested by water under high pressure. This [illegible] but one of the many steps necessary for supplying the consumer with present day high quality materials.



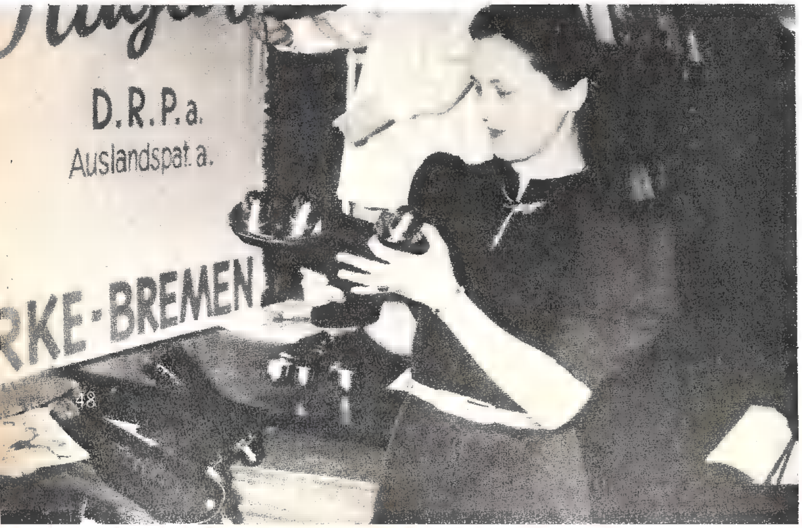
New Transport Plane Boasts Increased Flight Safety

PROCLAIMED by its designer, Wally Timm, of Los Angeles, Calif., as having more safety features than any airplane built, a new twin-engined transport is equipped with a tricycle landing gear, wing slots designed to prevent tailspins and wing flaps that are said to reduce the landing speed considerably. The new plane is a high-wing, semi-cantilever monoplane and is powered by two 425 horsepower engines.



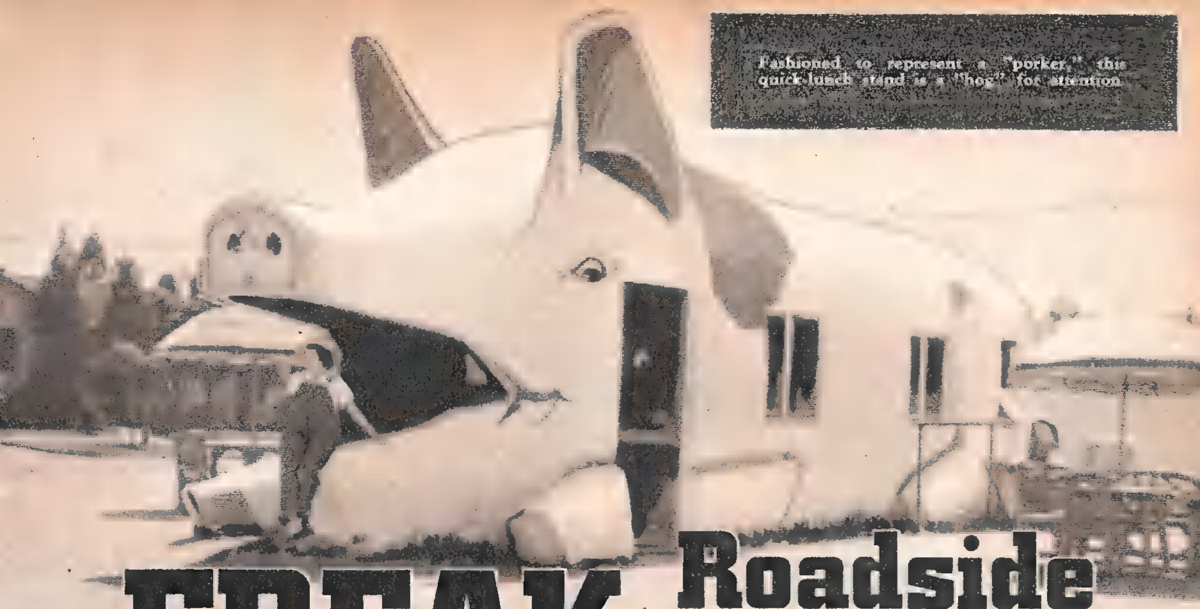
Old Coin Weighs 44 Pounds

AN UNUSUAL copper coin which was recently placed on exhibition in Stockholm, Sweden, is 25x12 inches in size and weighs about 44 pounds. Dated 1664, the coin's original value approximated 150 U. S. dollars.



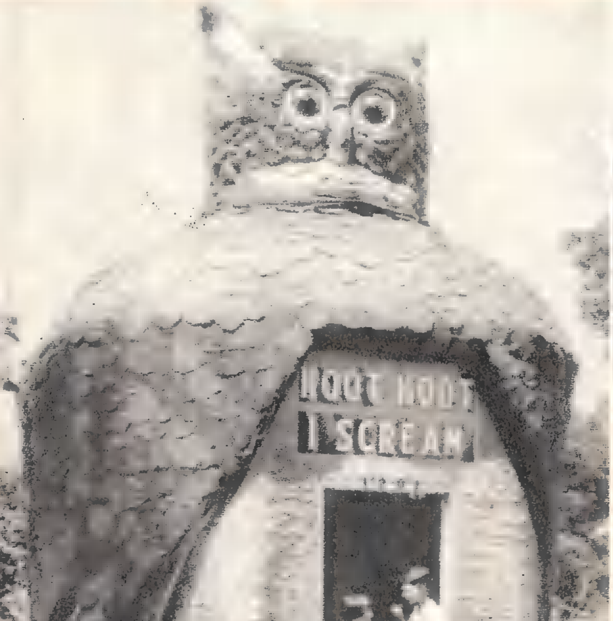
Novel Skate Has Ball "Wheels"

ATTACHED to the sole and heel of a shoe by means of small clamps, a newly developed German skate rides on three one and one-half-inch ball bearings protruding from cylindrical supports instead of the customary wheels.



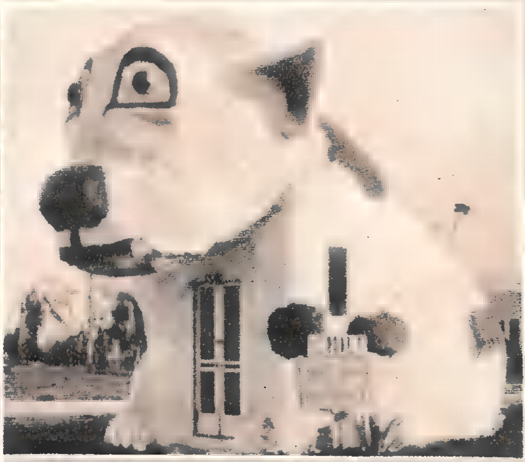
Fashioned to represent a "porker," this quick-lunch stand is a "hog" for attention.

FREAK Roadside Stands ATTRACT PATRONS

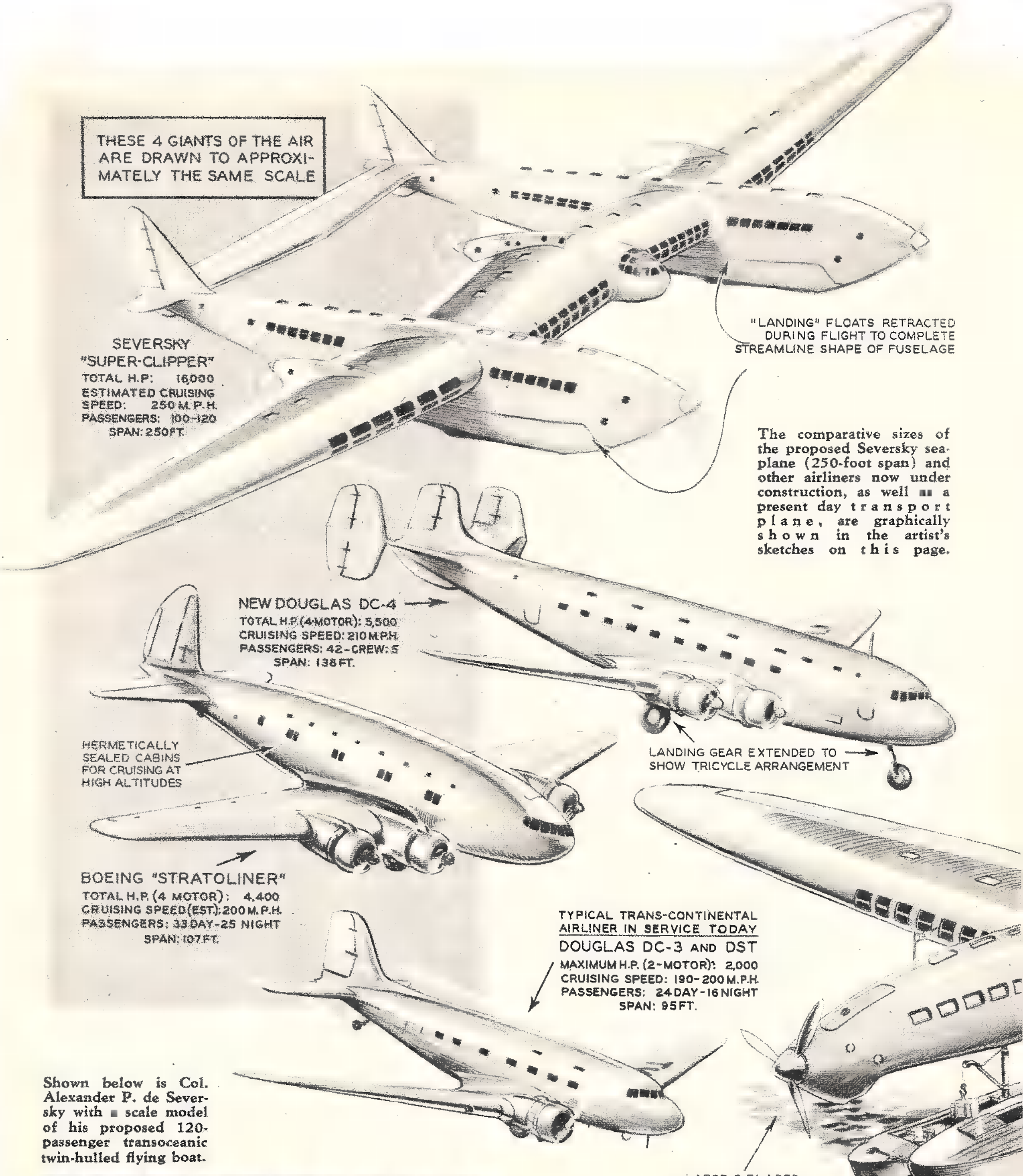


[illegible] old owl house[illegible]
[illegible]dies—a completely equ[illegible]

This igloo roadside stand helps [illegible] create [illegible] atmosphere almost [illegible] cooling as the ice cream sold inside.



Many a "hot dog" is sold within this suggestive stand.

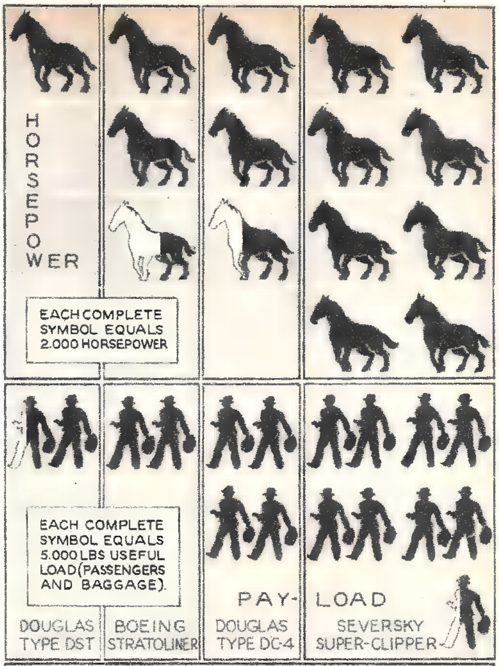

THESE 4 GIANTS OF THE AIR ARE DRAWN TO APPROXIMATELY THE SAME SCALE
SEVERSKY "SUPER-CLIPPER"
TOTAL H.P: 16,000
ESTIMATED CRUISING SPEED: 250 M.P.H.
PASSENGERS: 100-120
SPAN: 250FT.
"LANDING" FLOATS RETRACTED DURING FLIGHT TO COMPLETE STREAMLINE SHAPE OF FUSELAGE
NEW DOUGLAS DC-4
TOTAL H.P.(4-MOTOR): 5,500
CRUISING SPEED: 210 M.P.H.
PASSENGERS: 42-CREW: 5
SPAN: 138 FT.
HERMETICALLY SEALED CABINS FOR CRUISING AT HIGH ALTITUDES
LANDING GEAR EXTENDED TO SHOW TRICYCLE ARRANGEMENT
BOEING "STRATOLINER"
TOTAL H.P. (4 MOTOR): 4,400
CRUISING SPEED(EST.): 200 M.P.H.
PASSENGERS: 33 DAY-25 NIGHT
SPAN: 107 FT.
TYPICAL TRANS-CONTINENTAL AIRLINER IN SERVICE TODAY
DOUGLAS DC-3 AND DST
MAXIMUM H.P. (2-MOTOR): 2,000
CRUISING SPEED: 190-200 M.P.H.
PASSENGERS: 24 DAY-16 NIGHT
SPAN: 95 FT.
LARGE 3 BLADED TRACTOR AIRSCREWS EACH DRIVEN BY TWO 2,000 H.P. ENGINES

The comparative sizes of the proposed Seversky seaplane (250-foot span) and other airliners now under construction, as well as a present day transport plane, are graphically shown in the artist's sketches on this page.

Shown below is Col. Alexander P. de Seversky with a scale model of his proposed 120-passenger transoceanic twin-hulled flying boat.

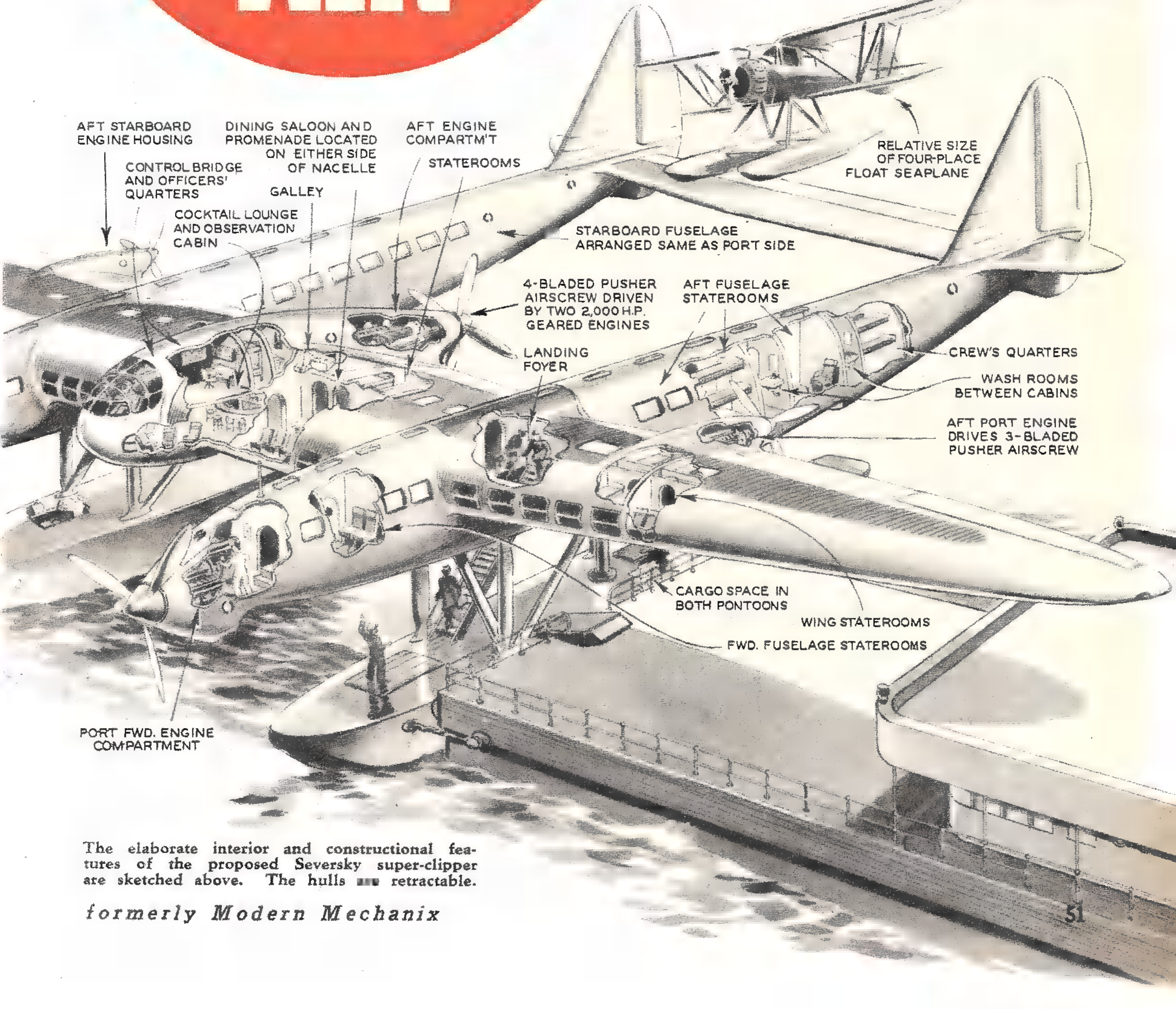
PLANS for a super-clipper seaplane capable of carrying 120 passengers at 250 m.p.h. for about 5,000 miles non-stop have been submitted to Pan American Airways by the Seversky Aircraft Corporation. The proposed air giant, with its wingspan of 250 feet, would dwarf the huge Boeing Stratoliner and Douglas DC-4 transport planes which are already under construction. (See accompanying sketches.)

The novel chart at the right provides a visual comparison of the power and pay load capacity of the projected and present day airliners. The Seversky plane, a giant among giants, will be capable of flying from New York to London in 14 hours.



POWER & PAY LOAD CAPACITY OF PROJECTED AIRLINERS COMPARED WITH TYPE NOW IN USE

NEW GIANTS OF THE AIR


AFT STARBOARD ENGINE HOUSING
DINING SALOON AND PROMENADE LOCATED ON EITHER SIDE OF NACELLE
AFT ENGINE COMPARTM'T
CONTROL BRIDGE AND OFFICERS' QUARTERS
STATEROOMS
GALLEY
RELATIVE SIZE OF FOUR-PLACE FLOAT SEAPLANE
COCKTAIL LOUNGE AND OBSERVATION CABIN
STARBOARD FUSELAGE ARRANGED SAME AS PORT SIDE
4-BLADED PUSHER AIRSCREW DRIVEN BY TWO 2,000 H.P. GEARED ENGINES
AFT FUSELAGE STATEROOMS
LANDING FOYER
CREW'S QUARTERS
WASH ROOMS BETWEEN CABINS
AFT PORT ENGINE DRIVES 3-BLADED PUSHER AIRSCREW
CARGO SPACE IN BOTH PONTOONS
WING STATEROOMS
FWD. FUSELAGE STATEROOMS
PORT FWD. ENGINE COMPARTMENT

The elaborate interior and constructional features of the proposed Seversky super-clipper are sketched above. The hulls are retractable.

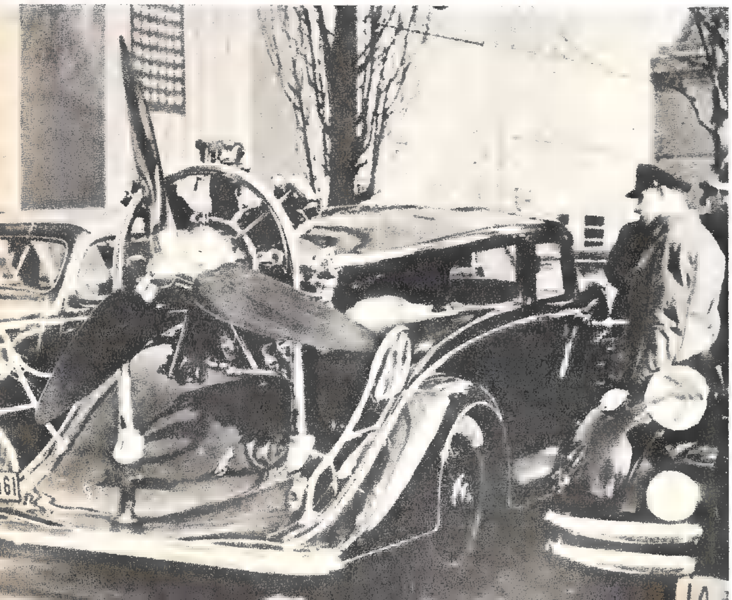
Creates Novel Job To Pay Schooling

PUTTING his high school biology studies to practical use, 18-year-old Sam Saikin, of Chicago, Ill., has created a growing business which, he hopes, will finance his college education. The business consists of supplying biological laboratories throughout the country with preserved parasitic growths and pig embryos which he obtains from local stock yards.

MISS TAMPA
TAMPA TO GENOA

Starts Sea Voyage In 18-Foot Ketch

STOCKING a rugged 18-foot ketch with food and marine gear, Al Lastinger, of Lakeland, Florida, recently set sail for Italy. Along with his passport and clearance papers, the 26-year-old sailor carried a letter from Governor Cone, of Florida, to Premier Mussolini, inviting the Italian dictator to enter an exhibit in the De Soto Exposition being held in Tampa. Lastinger is making the trip entirely unaided, the rigging and steering gear of his small craft being arranged to permit efficient one-man handling.

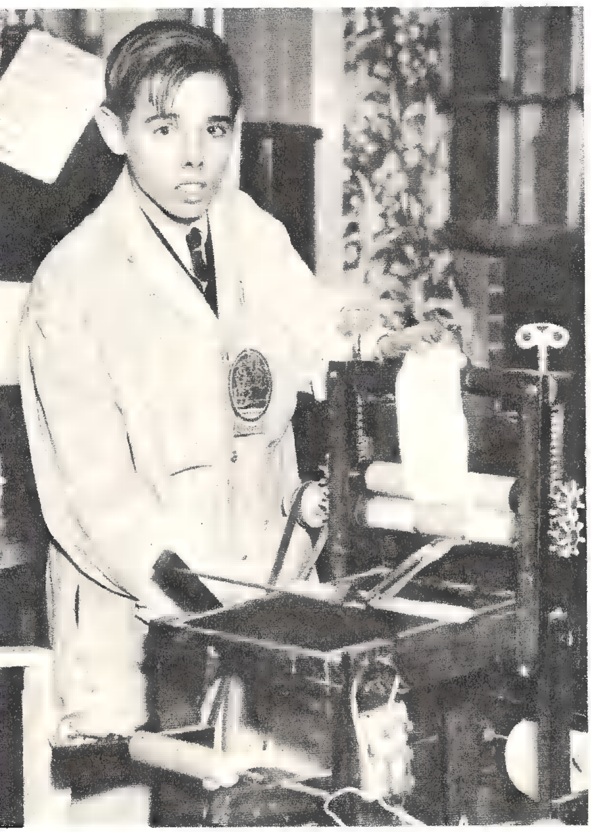


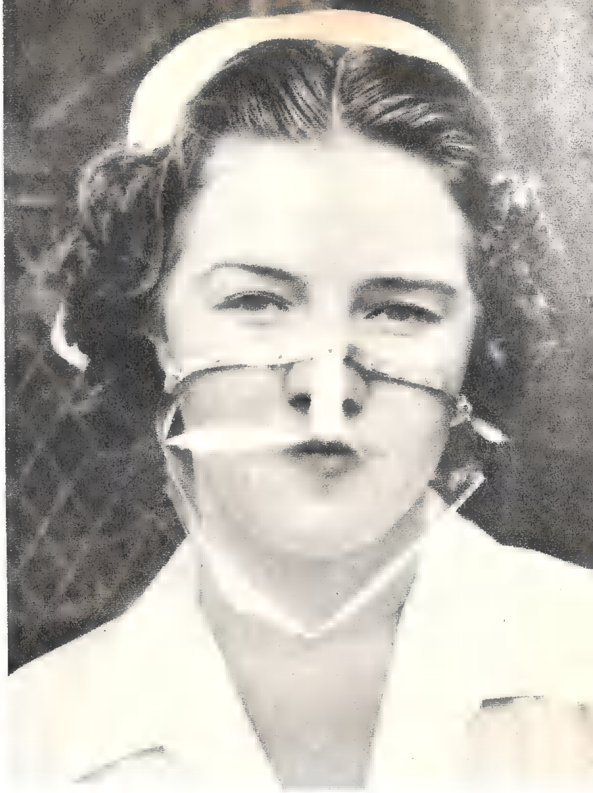
Car Features Two Types Of Engines

DESIGNED especially for high speed travel, a newly developed German automobile features two engines. One, a 150 horsepower airplane engine, is mounted externally at the rear of the car and drives an airplane propeller when the car is out in open country. The other motor is an ordinary auto type, housed under the front hood, which is used when the car is passing through towns.

Constructs Printing Press From Old Clothes Wringer

EXHIBITED at a science fair held in Boston, Mass., a novel printing press built from an old clothes wringer by Frank Jawroski, 18, created considerable interest among the spectators.



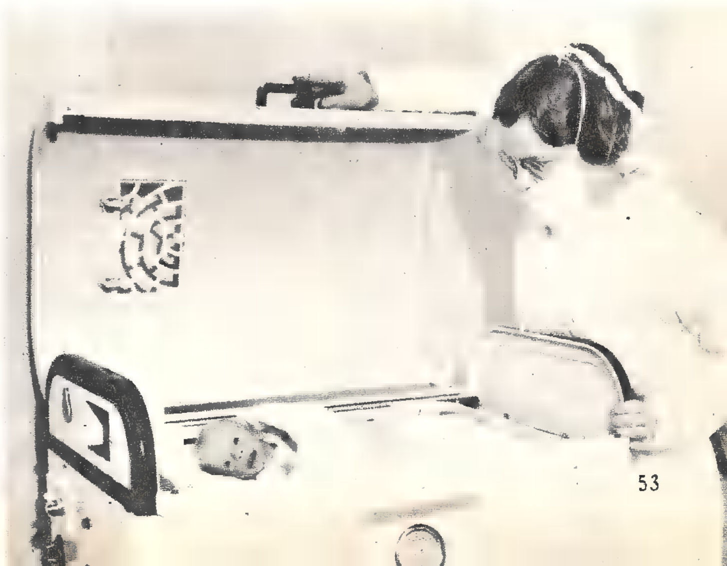


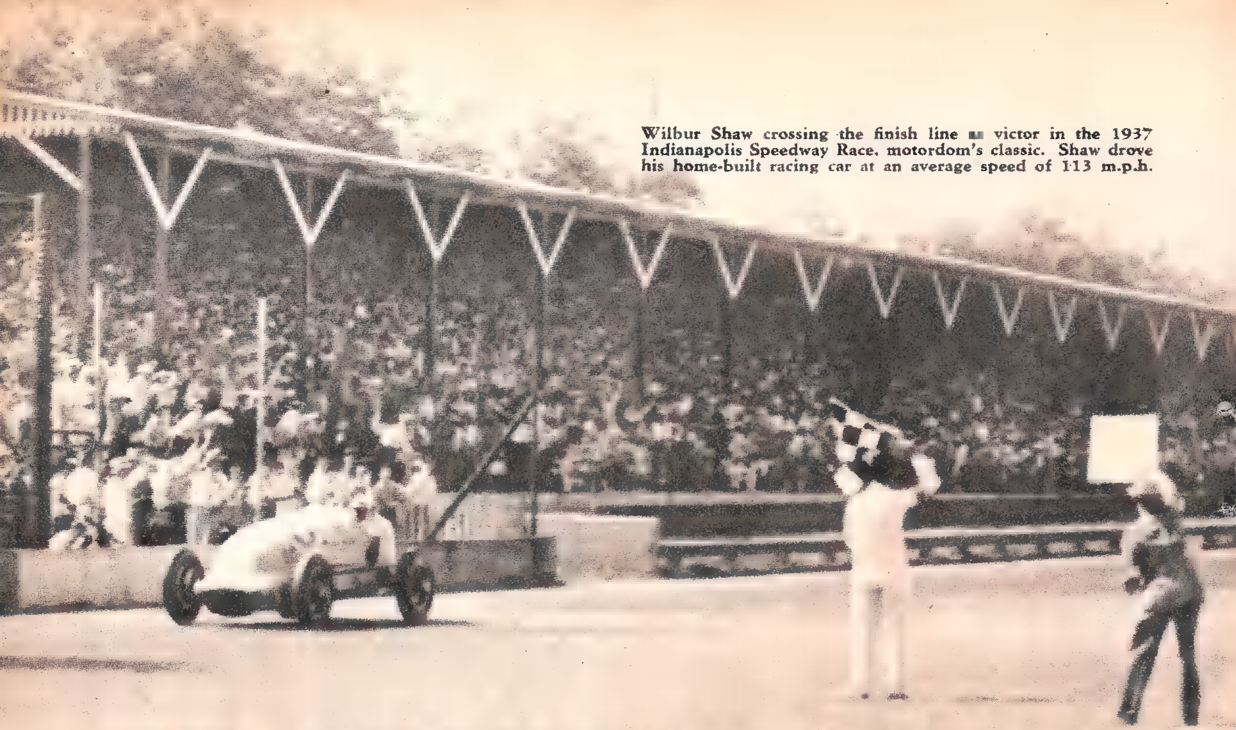
Surgical Mask Made From Transparent Material

INVENTED by a well known doctor, a new type of surgical mask is constructed from transparent material and, due to its flexible metal frame, can be instantly adjusted to fit the contour of the face. By permitting lip reading, the transparent mask enables doctors and nurses to converse more conveniently during an operation. An opening in the bottom of the mask permits air to circulate.

"Iron Mother" Unit Saves Babies

AUTOMATICALLY producing the precise conditions of humidity, temperature and air circulation as determined desirable for each individual infant, a new type of incubator is said to be invaluable in saving the lives of premature babies. The incubator consists of a portable metal cabinet which houses a crib, water reservoir, air purifier, etc.





Wilbur Shaw crossing the finish line as victor in the 1937 Indianapolis Speedway Race, motordom's classic. Shaw drove his home-built racing car at an average speed of 113 m.p.h.

BUILT TO WIN

Fred Offenhauser is the man who answers the speedway demons' prayers for engines that "can take it."

by R. De Witt Miller

"GODS of Roaring Road, give me a motor that will stand up! I'll do the rest."

Every Memorial Day at Indianapolis thirty-two men mutter that prayer, pull down their goggles, adjust their crash helmets, and think ahead of the 500 terrific miles between them and the checkered flag.

Out of that ever greater need for motors that will hold together for four to five hours at an average speed of better than 110 m.p.h. has come a new profession of master craftsmen: they are the geniuses of precision construction who build racing motors. And the dean of them all is Fred Offenhauser of Los Angeles, California.

His story runs like fiction, a full-blown action story of a mild mannered, bald-headed man who is afraid to ride in a racing car, and yet has built Indianapolis winners for the last four years. Once about twenty years ago Offenhauser rode in a racing car. When he got out, he leaned weakly on the hood and said:

"I think these things would run a lot faster if I stayed in a machine shop."

So he hibernated in a shop for a long time, and when he came out the world saw a motor that could go alongside the famous Liberty engine as one of the supreme pieces of mechanical perfection which America has built. But that's a bit ahead of the story.

Offenhauser first got into the motor building game in 1916, when a French motor broke down in Los Angeles. The nearest parts were in Paris, and the race was a week off. Somebody remembered that Offenhauser, then working in a small carburetor plant, had a genius for building precision parts. The job was presented to him with a lot of French adjectives. Offenhauser paid no attention to the adjectives, and duplicated every one of the parts perfectly.

This brought him to the attention of Harry Miller, at that time the world's foremost builder of racing motors. A few years later, Offenhauser was in charge of Miller's shop.

In 1933 Miller went out of this type of business. Offenhauser was left without a job.

He returned to Los Angeles, scrapped together all the money he could, bought some of Miller's heavy power tools, and set up in the motor building business. But his motors no longer had the magic name of Miller, which had become synonymous with perfection. Many of the drivers knew him personally, but they thought of him as the foreman of a shop, not a designer.

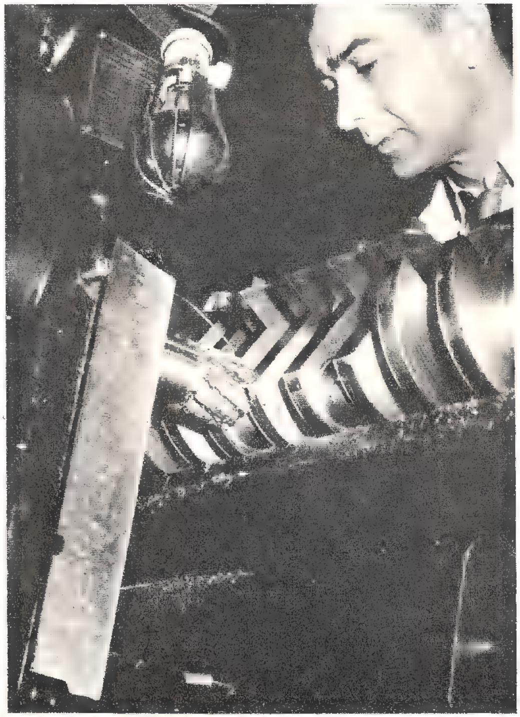
Early in 1934 Kelly Petello, daredevil little Italian, came to Offenhauser, looking for a motor to power his car in the coming Indianapolis race.

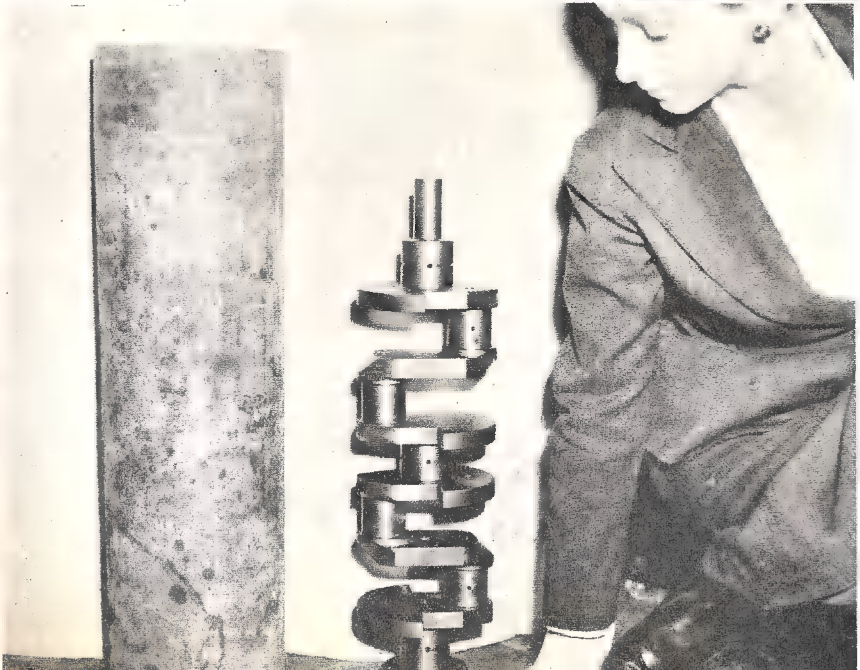
"Look here, Fred," he declared, "I've got enough money to buy a car, but I haven't a cent left for a motor. I want to take a crack at Indianapolis this year. Would you build a motor and take your money out of the prize —if I place?"

Offenhauser wiped his hands on his bald spot, squinted at the plans for a motor he had just designed, and agreed. Two weeks before the race, Kelly drove out on the Indianapolis track for a trial. The car turned up an average speed of better than 120 m.p.h. Both Kelly and Offenhauser were jubilant. The car was, however, using too much gas. A wire was installed by which the mechanic could turn off the idling jets when the car was running at high speed, and a second trial was run within a few days.

And then disaster struck. The motor broke down, making a complete overhaul job necessary. Kelly was in despair, but Offenhauser wasn't beaten. During hectic days he wrought black magic. Night and day he worked on the dismantled motor. And just *five minutes* before the trial period closed, Kelly again rolled out on the track. He qualified easily, but went into the race as the rankest kind of outsider.

For five hundred miles Offenhauser's motor took every strain the track and the anxious Kelly could give it. And when the checkered flag swished down, it was in front of Kelly's car. Offenhauser had built his first winner.





Precision construction is the secret of the ability of racing car motors to bear up under the gruelling grind of a long high-speed race, so Fred Offenhauser's shop in Los Angeles is equipped with some of the finest power tools produced. Shown above is a crankshaft being machined for a specially designed motor.

●

Craftsmanship in steel is shown in the photo at left. The racing car engine crankshaft was machined in the Offenhauser shop from a bar of special nickel alloy steel such as shown at the left in the photo. Not one of his motors has ever failed during a race and many have powered cars of many winning drivers.

That was in 1934. In 1935 an Offenhauser motor again won the classic and other of his power plants were in the money. Then in 1936 the black curse of breakdown struck once again.

On a practice run Louis Meyer's motor threw a connecting rod through the block. But Offenhauser was prepared this time. He had brought along a spare motor and this was hurriedly installed.

The jinx, however, was as resourceful as Offenhauser. On the next trial run another connecting rod snapped, and for the second time sliced Louis's motor almost in two. That looked like the end. But Offenhauser is a tough guy to beat.

He wired Los Angeles and had a new block shipped by air express. Forty-eight hours later it was being installed in Louis's car. Again Offenhauser stared at his watch and pulled out his hair. And again the car qualified minutes before the trials closed. *Louis Meyers was the first driver to see the checkered flag when the race was run.*

In 1937 Offenhauser motors took first, second, fifth, eighth and ninth places. In those four years not one of his motors ever broke down during a race. Drivers were forced out because of trouble with the chassis or bodies, but never because an Offenhauser motor couldn't take it.

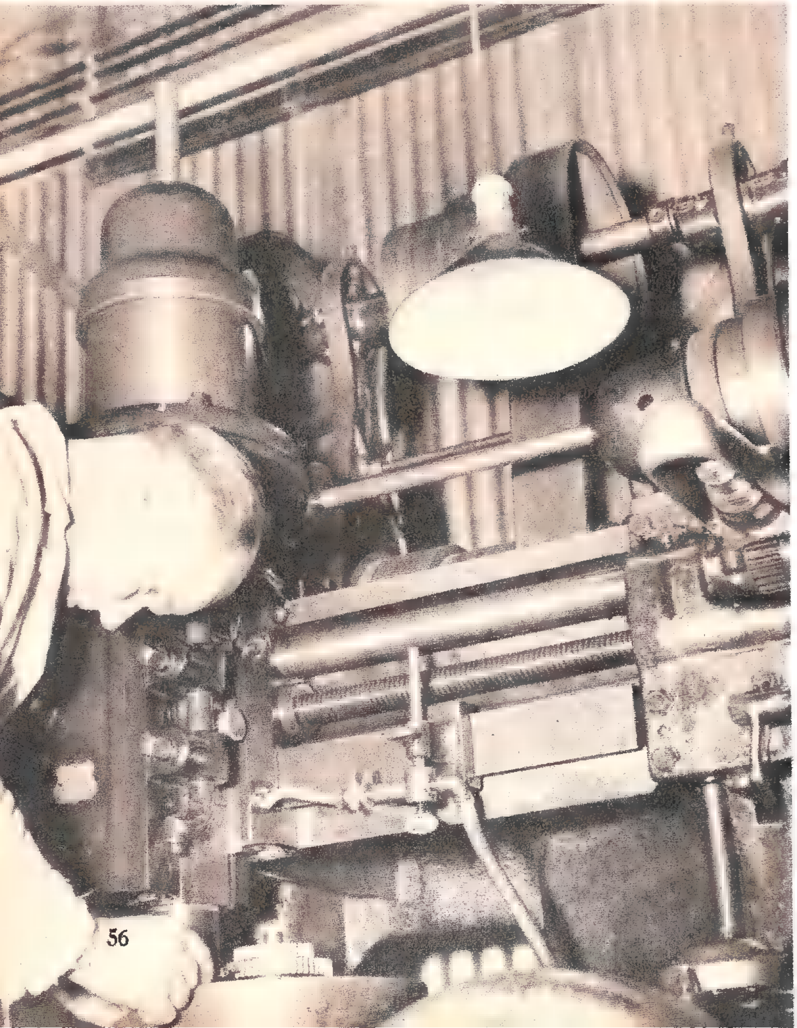
How can a man practically remove the chance of mechanical failure from a motor which must stand the hardest test an internal combustion engine ever receives? Will he do it this year? The best way to answer these questions is to tell the story of how an Offenhauser motor is built.

The first step is to select suitable materials. The motors must be light, and yet stand up under terrific strains. The four-cylinder Offenhauser motor turns up 5,500 r.p.m. (The average six-cylinder motor in a medium priced standard car is capable of 4,500 r.p.m. —but try and drive it at that speed for four hours).

The compression ratio of the Offenhauser power plant is *twice* that of a normal motor.

For the block a nickel alloy iron is used, which gives maximum hardness and a very fine-grained casting. The crankshaft is nitralloy steel which is cast at only 1,000° F., giving a very high tensile strength. It is then treated in a special air-tight furnace. The crankcase, timing gear housing, camshaft housing, and intake manifold are from an aluminum alloy. Manganese bronze, having terrific strength, is used for engine brackets and bearing supports. In fact, the Offenhauser motor is a dramatic textbook on the latest in metallurgy.

"I always investigate any new metal or alloy," Offenhauser says. "My experience with Miller taught me the importance of eternal testing and checking of new materials."



Considered the dean of racing car engine builders, Fred Offenhauser, shown making an adjustment on one of the giant gear cutting machines with which his shop is equipped, earned the title by sheer mechanical genius plus plenty of hard work over a period, of years.

Driver and builder get together to discuss business. Louis Meyers, famous racing car driver (left) and winner of the 1936 Indianapolis Race, and Fred Offenhauser, master engine builder, examine castings of a transmission case constructed for a racer.

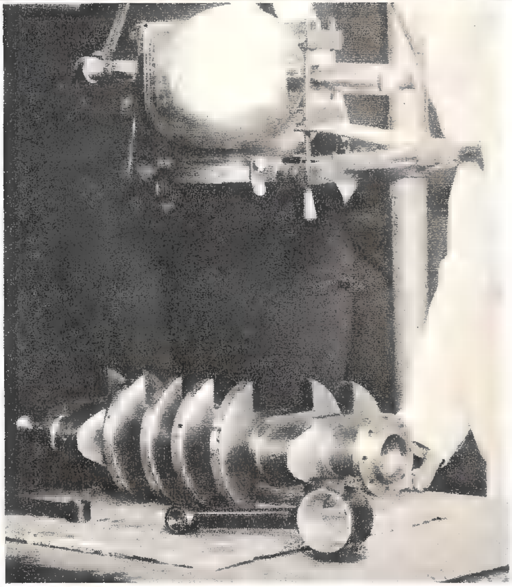
All new materials are given hardness, tensile strength, expansion, and heat tests. When the metals are selected, they are cast to the rough shape desired. Then the machinery in the Offenhauser shop goes into action. Some of the finest heavy duty power tools in the world are used in this work. An ordinary looking bar of nickel steel, two or three feet long and about six inches in diameter, becomes beautifully turned crankshaft. Rods and housings begin to take precise shape.

Then comes more testing. A casting may go through all the machining, look perfect, and still have a hidden flaw. Such a casting will play the very devil with the most careful work. Recently, however, two methods have been devised to eliminate this bugbear of motor designing.

Some castings are tested by X-ray. An even more delicate method, known as the *magnaflux* test, has been developed during the last two years. A casting to be checked by this test is first immersed in a bath containing lamp black and iron filings. Next the casting is placed between the poles of a special electro magnet. It is then washed. Any internal flaw will cause an opposition of the positive and negative magnetic fields at the point of the flaw. The iron filings will collect at this point, and the lamp black will leave a mark exactly corresponding to the shape of the flaw.

After all the castings to be used in a motor are tested and found perfect—and perfect according to the Offenhauser standard means something approximating the theoretical absolute—the fine machine work is done.

Racing motors are not, however, fitted as tightly as those of standard cars. Compared with the motor of the average pleasure car, a racing power plant seems extremely noisy. The large amount of clearance is needed to allow for expansion of the parts under the super-heated conditions of a race.

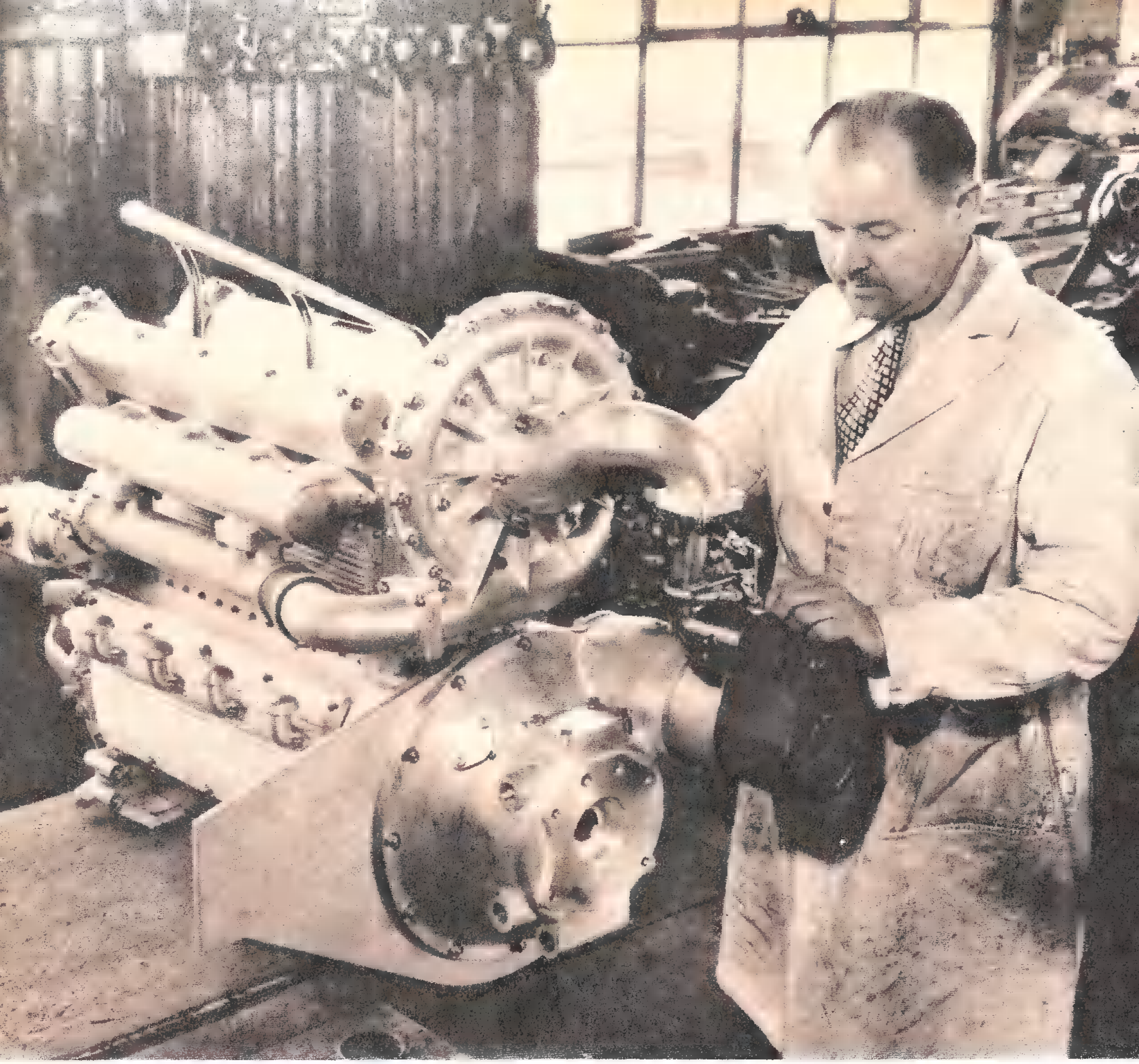


The X-ray plays a part in the eternal checking which is so vital in producing Indianapolis Race winners. Shown above is a crankshaft being submitted to an X-ray examination. The rays from the tube pass through the casting and leave a record of its internal structure on a photographic plate beneath it.

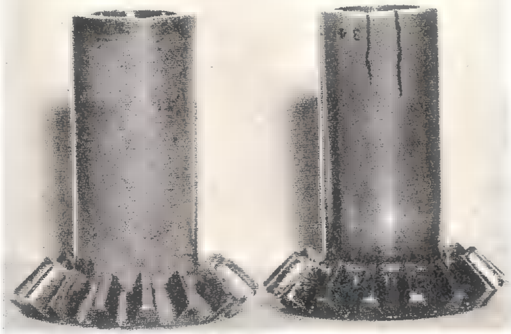
But don't let the noise of a racing motor fool you. Each part is machined with almost unbelievable accuracy. In fact, these motors are so accurate that they require no breaking in. When they leave Offenhauser's shop, they are ready to race. A few slow laps to heat the oil and water, and the power plant is prepared for the big grind.

Accuracy, accuracy, ACCURACY—that is the eternal password among the builders of racing motors. As Offenhauser says:

"Drivers can afford to be superstitious, I can't. There's one "throttle thumper" who has fits if anyone in his pit eats peanuts during a



A winner! This is the Offenhauser motor that Wilbur Shaw used to power his home-built racing car with which he broke ten years bad luck to win the 1937 Indianapolis speed classic. This engine's compression ratio is twice that of plain types.



Exacting tests of all machined parts are made before Offenhauser assembles a motor deemed worthy to bear his name. To the eye these castings appeared identical and perfect, but when submitted to a magnafluxing test, the details of which are explained in the text, the casting on the right showed two flaws that would have caused a breakdown during a race.

race. Another driver won't drive until he's eaten a dish of chow mein. Another fellow carries a girl's handkerchief inside his crash helmet. But I can't be superstitious. I have to go to a testing laboratory, instead of a fortune teller."

Anyway, you don't have to go to a fortune teller to predict that Offenhauser motors will be in the money this year. Four years and four winners is a pretty good record.

Which brings us to this year's race, and the new problems which come with each succeeding session on that famous oval. A good many of these problems will be met by the drivers in some split second decision, but a good many more will be solved in the shop long before race time. Most racing motors are ordered at least four months before the race. Power plants have, however, been built in eight weeks. When you have to construct a tailor-made motor in that time, you work night and day, and use up your vocabulary. The four-cylinder Offenhauser motor, without a supercharger, costs $2,500.

This year the principal alteration in motor design is the result of the rule change which permits the use of "doctored" fuels. Last year only standard gasoline could be used, but when the starting bomb is fired in 1938, the gas tanks will be filled with all sorts of fancy mixtures containing tetraethyl, benzol and alcohol. Some cars will use pure alcohol, although this will add a new problem, due to the larger fuel consumption. The restriction on the amount of fuel consumed during the race has been eliminated, but the restriction imposed by gravity hasn't been repealed yet. Extra fuel means extra weight.

To get the maximum out of these conditions, the timing of Offenhauser motors has been lengthened. This will give greater speed and power but will cause the motors to consume more gas. The blocks have been slightly lengthened. More straight-eight motors will be used this year and the compression ratio has been increased to 14 to 1.

The majority of Offenhauser motors have four cylinders. A mysterious straight-eight or two are, however, being constructed. The eight cylinder jobs have greater smoothness and acceleration, but they consume more

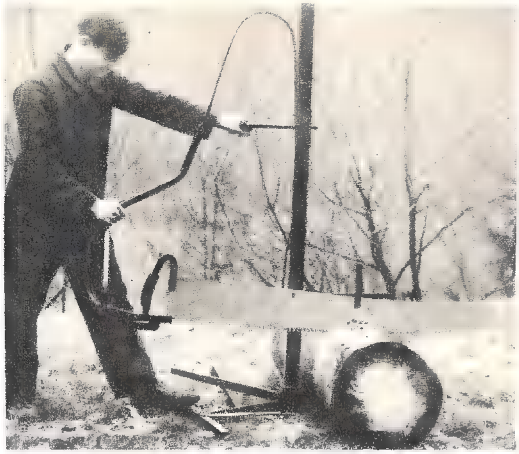
[*Continued on page* 136]

Capable of standing the most terrific punishment to which parts of an internal combustion engine can be subjected, yet so light that a woman can support it on two fingers, this aluminum alloy manifold may play an important part in the 1938 Indianapolis Race. Every part of the winning engine must be perfect, for breakdowns mean a lost race.

Radio announcers crowd around Wilbur Shaw and his mechanic, Johnson, a few minutes after he crossed the finish line as winner of the 1937 Indianapolis Race. One can readily appreciate the endurance and precision that must be built into a racing car engine by pondering the fact that Shaw's car traveled the 500 miles in 4 hours, 24 minutes.

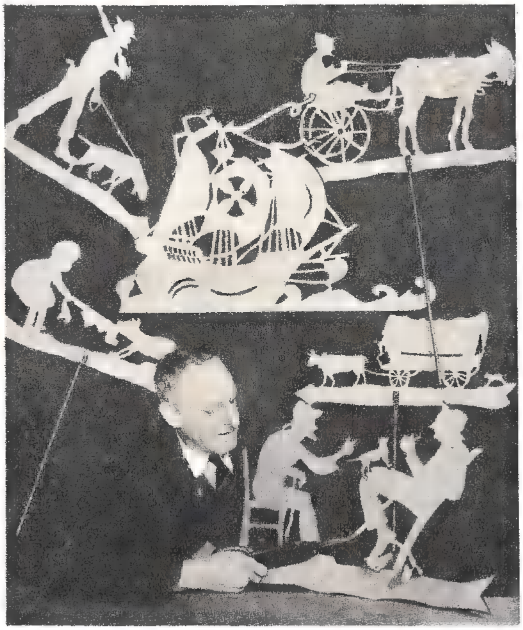
LION HEAD
SPECIAL

Kelly Petello, daredevil Italian racer, was the first man to drive a winning car powered by an Offenhauser motor. In the photograph above, he is shown just after receiving a golden helmet after winning a dash on a western track. When he entered the 1934 grind, Kelly staked his savings from years of driving on the Offenhauser engine.



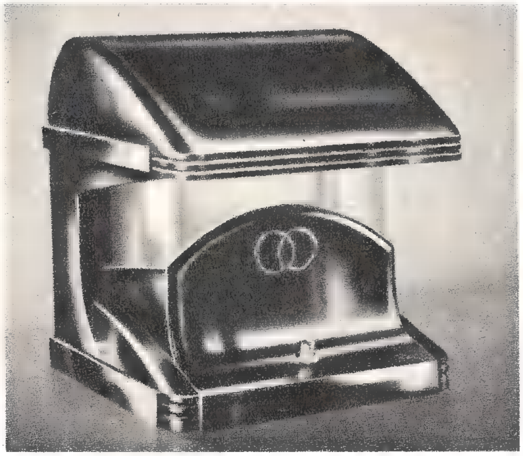
One-Man Cross Cut Saw Fells Large Trees Quickly

THIS one-man cross cut saw easily fells large standing trees, and cross cuts logs and timbers of any size lying on the ground. It does the work faster than two men with the conventional type saw, and with less than the usual amount of effort. The saw blade is attached to a frame or carriage, which is securely clamped by three large claws to the standing tree or log that is to be cut. The frame is 63 inches high and the saw blade is 59 inches long. The blade is moved back and forth on a curved arm or handle which is suspended from a large curved flat spring.



Artist Finds Making Weather Vanes Profitable Hobby

SEVERAL years ago Henry Marx, an artist living in Beverly Hills, California, started making weather vanes and metal art novelties as a hobby. Visitors to his home sought to purchase his product, and soon Marx developed the hobby into this unusual business. He creates the weather vanes from sheet metal, adapting drawings and pictures from various magazines. His interesting weather vanes include ships under full sail, covered wagons, a hunter and his dog, and many other suitable subjects. When placed at the top of a flag pole or house, they lend a pleasing appearance, as well as serve a useful purpose. If desired, they can be painted with bright colors. Many metal craftsmen will find weather vanes a new subject for their metal cutting shears.



Polaroid Lighting Unit Gives Glareless Illumination

REVOLUTIONARY in performance and design, this Polaroid lighting unit is intended primarily for desks. Presented as the only known method of completely eliminating glare, optical and illuminating authorities hail the lamp as a forerunner of a new era in lighting. The glareless feature permits focusing of light on the working plane and gives even distribution over the entire surface. Polaroid lighting has no reflected glare; therefore vision is easy and precise. Colors are enriched, contrasts increased, and detail is intensified.

Builds Gas Model Of Douglas Plane

REPRESENTING about 900 hours work, a gasoline-powered model of a Douglas DC-3 air liner constructed by James Beard, of South Bend, Ind., is valued at $2,000. The model deviates from its prototype in that it has pontoons and only one engine, which is said to fly the three and one-half pound replica for 27 minutes on one ounce of fuel. The model has a wingspan of 66 inches and features cellular construction.

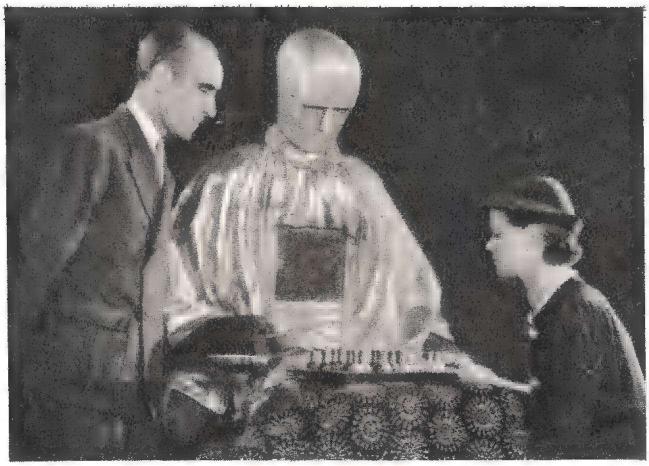
Puppet Show Teaches Traffic Laws

THE ancient art of puppetry has been enlisted by the Bureau of Public Safety of Detroit, Mich., in a novel campaign to cut the accident toll of modern traffic. A play—"Stop, Look and Listen"—enacted by marionettes, is being shown at all of the city's schools in an effort to impress children with safety rules. The cast of marionettes features a policeman, a teacher, children, stop lights, and traffic in the form of model automobiles, which are actuated by motor-driven belts.

SAFETY PLAYHOUSE
DETRO
POLI

Robot Checker Player Is Undefeated

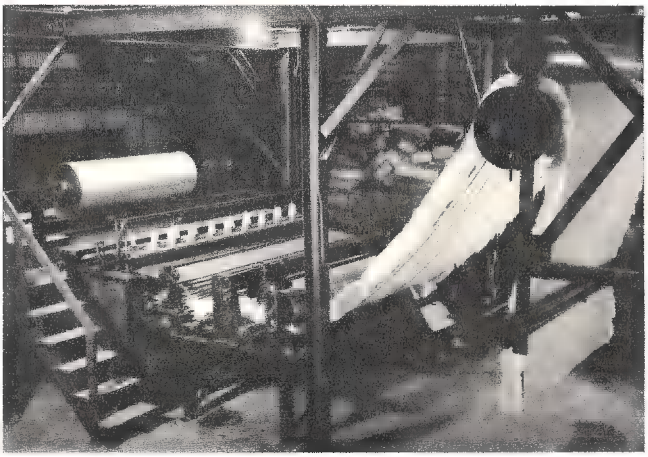
OWNED by Frank Frain, of New York, N. Y., a mechanically created robot is said to have played in more than 25,000 checker matches without being defeated. Sponsored by a well know radio manufacturer, the "Magic Brain Checker Player," as the robot is known, is making a tour of the country. Standing six feet tall and weighing 500 pounds, the robot disdainfully sweeps the checkerboard clear of checkers if its opponent attempts to cheat.



Solitaire Bridge Board Gives Expert Opposition

A SOLITAIRE bridge game with this board supplies the player with expert opponents and an expert partner. The player bids only his hand, and the partner and opponents automatically bid correctly, no matter how inexpert the player may be. The bidding is adaptable to all systems. It is claimed that with a rudimentary knowledge gained from any self-teaching bridge book, a player can perfect his game by using this board. In use, the board's hands are played exactly like those in a game of contract. After the bidding is finished, playing starts. The player can make errors, but because the opponents are experts, they capitalize on mistakes.

Giant Machine Sews Ten-Foot Blankets

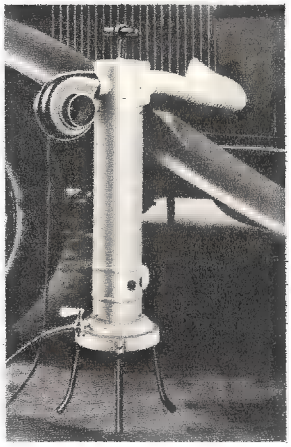


TWELVE rows of stitches are sewn simultaneously by the largest sewing machine in the world. This machine is used to stitch cloth onto ten-foot wide blankets of glass wool five inches thick. Because of the resilience of the fibres in the "wool," there is no tendency to settle under continuous vibration, thereby making it especially useful for insulating trucks, buses, refrigerator cars and air ducts.

Flash Takes 2 Bulb Sizes

A NEW synchronized flash-gun attachment for cameras features an adjustable reflector designed to center exactly over flashbulbs of both small and large sizes.

Portable Car Heater



MAKING it unnecessary to heat the entire garage, this gas-electric warmer uses any type of gas for fuel, and electricity to operate the blower motor. The heated air is forced through the louvre openings.

Opportunities For The SMALL INVENTOR

Water skiing, a new sport packed with thrills, has been promoted in this country through the help of Northill water skis, which feature an adjustable foot receptacle.

In their offices, Ada Wilbur (left) and Blanche Hill inspect an hydraulic pump. In the background is an anchor which will hold a twenty-foot boat.

John K. Northrop, famous airplane designer, with one of his lightweight folding anchors which does the work of other anchors weighing 20 to 30 times as much.

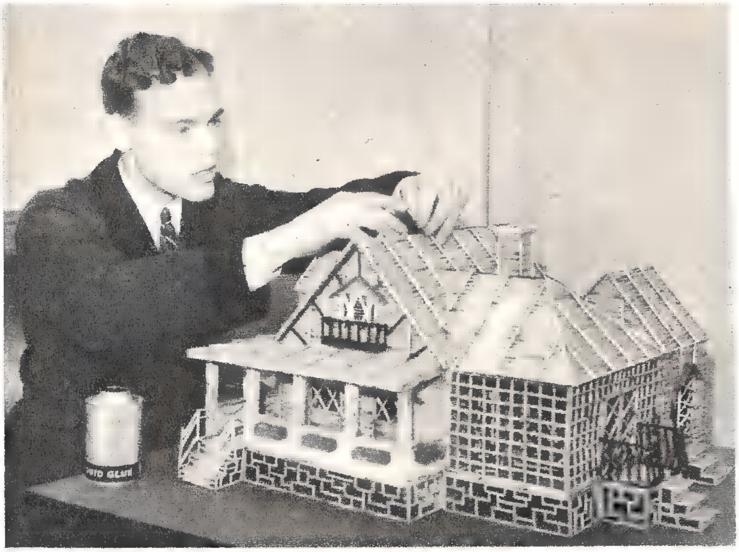
EMPHATICALLY answering the frequently-heard question — "Do small inventors have a chance today?"—a Los Angeles concern has been proving for sometime that inventors not only do have a chance, but that money is to be made for everyone.

Today the company has direct sales offices in principal American cities; it has international representatives scattered through twenty-nine nations around the world; it has leased manufacturing rights on several of its items to a British firm for overseas manufacturing; it has the services of an internationally known engineer as active consultant and a staff of engineers under his direction, and it has built itself an ultra-modern building in Los Angeles to house its executive and sales staff and its assembly and shipping departments.

Blanche Hill and Ada Wilbur, president and secretary-treasurer respectively, of the

[*Continued on page* 140]

Builds Model Bungalow From 10,000 Matchsticks



COMPRISED of more than 10,000 burnt matchsticks, which his friends collected for him, a novel model bungalow has recently been constructed by Russell A. Dade, of Montreal, Canada. Furniture for the bungalow's tiny rooms was also built-up from matchsticks. No nails or pins were used in assembling the model, each matchstick being held in place by glue. About three pints of glue were required for the job, which represents five months spare time.

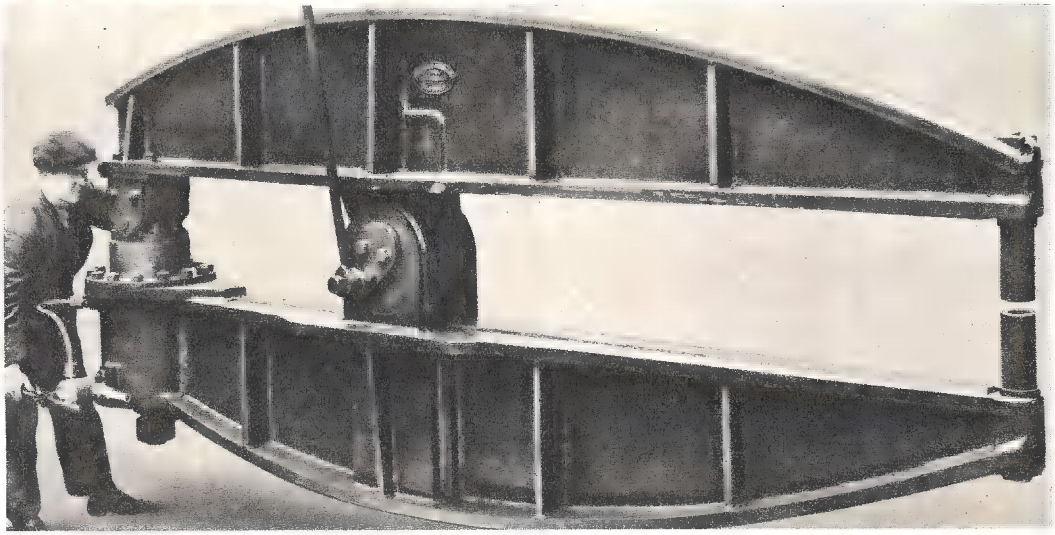
DRIVER
HAS
NO KEYS

Auto Safe Thwarts Hold Ups

TO THWART hold ups of its drivers, a delivery firm has equipped its autos with safes attached to the truck with tamper-proof bolts. Keys are kept in the main office.

Hand Guides Giant Riveter

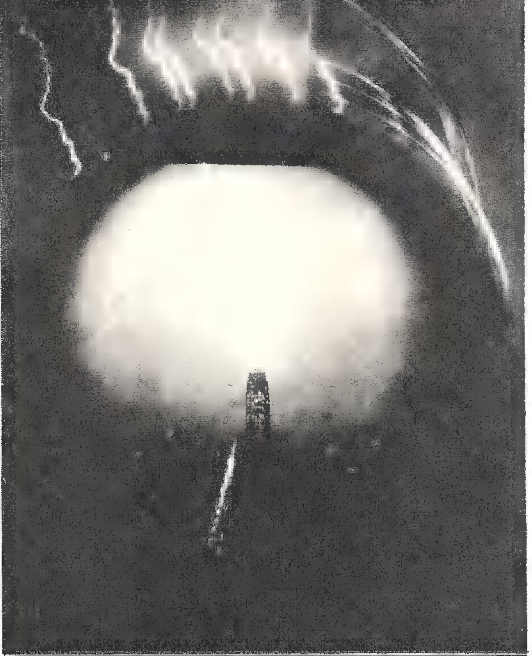
EXERTING a force of 40 tons on huge rivets used in construction work, a new hydraulic riveter weighs four tons, but is so delicately balanced that it can be tilted or swung by a mere touch of a workman's hand.



Welder Makes Own Oxygen

UTILIZING an old gas tank holding carbon, an electric motor, a tank for acetylene gas and a wheeled frame, a Michigan craftsman has developed an outfit that enables him to make oxygen for welding.

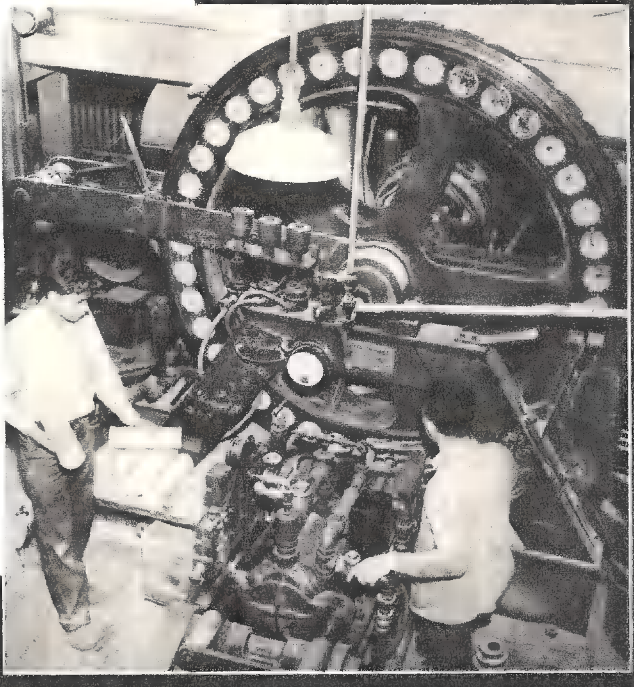
Lightning Poses For Photo

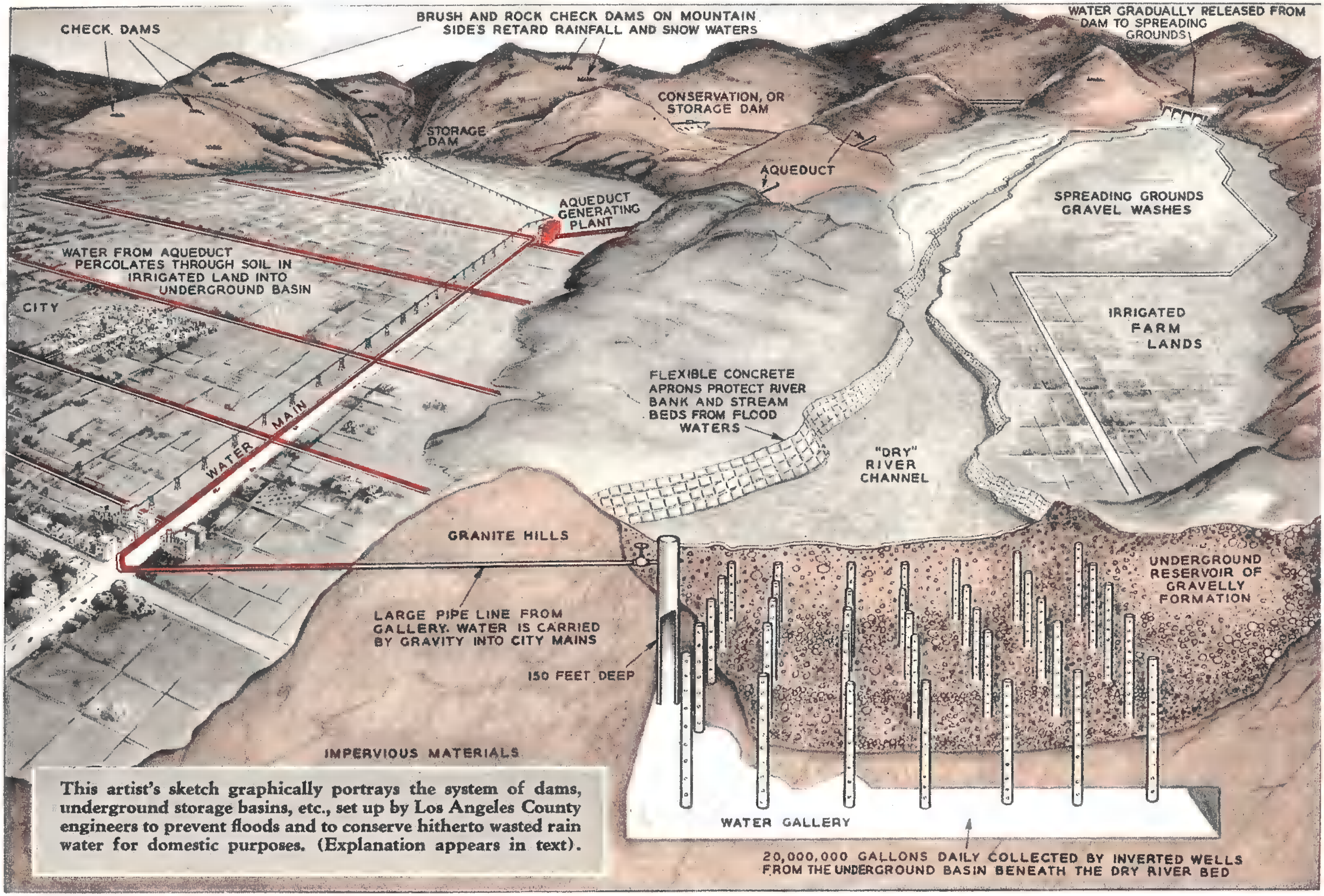


USING a special high speed camera, General Electric engineers obtained this unusual photo of the Empire State Building in New York, N. Y., being struck by lightning 11 times in 0.36 of a second.

Device Converts Sawdust To Logs

CLEAN sawdust and shavings, fed into the hopper of a newly developed machine, emerge a few seconds later in the form of a hard, round log. The machine consists essentially of a large wheel containing individual holes into which a ram under pressure of 185,000 pounds is guided, compressing the mass of shavings in each hole to one-ninth its former volume.




CHECK DAMS
BRUSH AND ROCK CHECK DAMS ON MOUNTAIN SIDES RETARD RAINFALL AND SNOW WATERS
WATER GRADUALLY RELEASED FROM DAM TO SPREADING GROUNDS
CONSERVATION, OR STORAGE DAM
STORAGE DAM
AQUEDUCT
AQUEDUCT GENERATING PLANT
SPREADING GROUNDS GRAVEL WASHES
WATER FROM AQUEDUCT PERCOLATES THROUGH SOIL IN IRRIGATED LAND INTO UNDERGROUND BASIN
CITY
IRRIGATED FARM LANDS
FLEXIBLE CONCRETE APRONS PROTECT RIVER BANK AND STREAM BEDS FROM FLOOD WATERS
WATER MAIN
"DRY" RIVER CHANNEL
GRANITE HILLS
UNDERGROUND RESERVOIR OF GRAVELLY FORMATION
LARGE PIPE LINE FROM GALLERY. WATER IS CARRIED BY GRAVITY INTO CITY MAINS
150 FEET DEEP
IMPERVIOUS MATERIALS
WATER GALLERY
20,000,000 GALLONS DAILY COLLECTED BY INVERTED WELLS FROM THE UNDERGROUND BASIN BENEATH THE DRY RIVER BED

This artist's sketch graphically portrays the system of dams, underground storage basins, etc., set up by Los Angeles County engineers to prevent floods and to conserve hitherto wasted rain water for domestic purposes. (Explanation appears in text).

FIGHTING WATER FAMINE

Scientific water conservation methods are man's salvation.

by D. A. Lane

Water Development Engineer
Los Angeles Department of Water & Power

THE floods which spread devastation and death in southern California last March brought home to the nation once again the terror that lies in water when it breaks beyond man's control. Properly harnessed and handled, water is a boon without which life would cease to exist; out of control it becomes one of man's most dreaded enemies. It is both killer and life-giver—friend and menace.

Above—This home was wrecked as a result of a cloudburst near Montrose, Calif., before proper flood control methods to divert rain waters into the ground were adopted. Left—An engineer using a device that gauges a river's rate of flow.

The spectacular nature of the recent floods dramatized the destruction which water sometimes inflicts, but there is another side to the problem which is far more threatening and which is not generally realized. Too much water means loss of life and property in restricted areas; but too little water threatens the very basis of human existence in vast sections of the country where population is thickest. That is why engineers viewed the catastrophe of last March not only in terms of lives lost and property destroyed, but also in terms of waste—waste of precious water that could be hoarded and put to work serving man instead of destroying him.

For some time, engineers in the West have been working on ingenious systems to preserve water and thus protect millions of people who live under the threat of water famine. The engineers are employing one underlying principle to meet this great problem of modern times:

To save water, *pour it into the ground!*

This sensational new system of water-saving causes wells to flow backward and rivers to run upside down. Mountains dotted with hundreds of miniature dams soak up water like huge sponges. Runaway watercourses are equipped with flexible bottoms, tailored to fit like gloves. Underground wells, drilled on their sides, draw millions of gallons daily from an empty river whose bottom is dry as dust. Billions of bacteria, contained in yeast are made to digest raw sewage, miraculously purifying it into sparkling clean drinking water.

A crisis came when wells supplying water for the city of Los Angeles dropped ominously low. Slow seepage from the ocean began to turn some wells to brine. Thirty-four had to be abandoned. Over an area of 162 square miles, the subsurface water-level dropped below the sea. The city still had the man-made river built twenty years ago by William Mulholland, which brings water 250 miles from the high Sierras, but local sources which for years had supplemented it were failing.

Geologists spoke plainly when asked for advice. Twenty-six great underground lakes, they said, supply all wells in the region. During the wet season, rainfall recharges this great natural reservoir. But since the cities have grown, the rain, now falling on acres of roofs, and on more than fifty square miles of paved streets, is carried off in storm drains to the ocean instead of returning to the ground. Meanwhile, a growing population draws more and more heavily on the rapidly falling subterranean lakes.

Above—Hinged concrete slab beds and concrete banks are fitted to runaway watercourses so that the water can be carried to specially located spreading grounds where it will gradually be absorbed and stored in subterranean reservoirs. Right—Laying a section of typical aqueduct pipe in place.

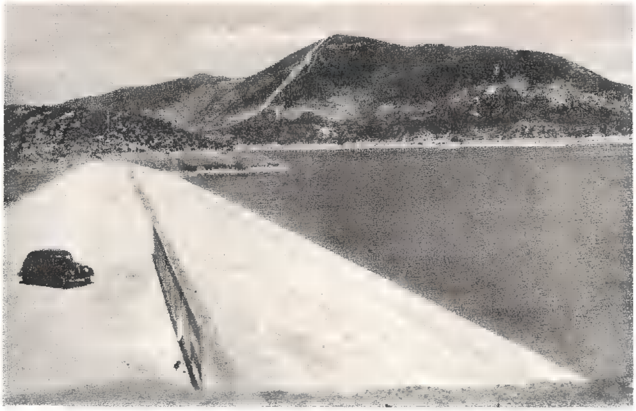
In our modern homes water is wasted shamefully. Every time a housewife wants a cupful of hot water, she goes to the faucet and runs about a gallon of cold water into the drain. Americans use about 140 gallons a day per capita, on the average. On the other hand, citizens of Berlin, London, and Paris, use only about 45 gallons a day. The average American wastes that much every twenty-four hours!

Engineers looked about for new sources of the precious fluid. They saw the storm drains carry away whole rivers of water. They saw rain-washed mountains shed racing torrents which swept down gravel washes and stream beds to vanish into the ocean without adding more than a small amount to the contents of the underground basins. They saw an earlier flood submerge farms and city streets, doing $10,000,000 damage while more than a million dollars' worth of water was being lost—enough to supply the needs of 450,000 people. The floods of last Spring brought the problem into sharper focus than ever before.

We must make the mountains absorb more water, engineers said. The mountains must suck up rain like sponges, instead of allowing it to race down the slopes, scouring gullies and stripping away vegetation.

Cooperating agencies of city, county, state, and the federal government began to gather data. Rainfall was measured at 310 stations. Twenty-seven hundred wells were sounded regularly; streams were gauged at 1,500 points. At 57 stations high in the mountains, snow-shoe crews punched through the snow blanket with circular core-samplers, cutting cylinders which they weighed to estimate the amount of water thus stored. Other observers estimated the amount of debris carried away, and measured precipitation and run-off. United States Geological Survey field men supplied still more figures.

Workmen were set building check-dams. All over the hills they piled brush, drove posts, and poured concrete. High up on the mountains they erected tiny barriers of stone, branches, and wire netting at points where



Left—This large city reservoir is small when compared to the huge underground storage basins created by engineers. Above—A rock, wire and brush check dam that serves to slow the onrush of water down a mountain side, allowing it time to soak into the ground.

gullies converged and channels were forming. Lower down, they built more substantial dams with cement foundations. These barriers were not to store the water, but merely to check its onrush, allowing it more time to soak in and tremendously reducing its power to strip off the topsoil.

Rains brought down debris which matted and chinked up the dams. Shrubbery grew thicker. Gradually the mountains were carpeted with a spongy litter of leaf-mould, twigs, and branches, which absorbs water readily and lets it percolate slowly into the ground. Experts estimate the value of this cover at from $250 to $1,000 per acre.

Having stopped the little leaks at the source, engineers next planned to trap the heavy floods which still roared down the canyons during rains. Mountain reservoirs would not do, for in order to harvest a large enough "water crop" lakes of terrific size would have to be impounded. Sunshine absorbs tremendous quantities of water from open reservoirs, but water poured into granite basins below ground remains.

To place these dams strategically, an airplane survey was made. Mapping planes zigzagged back and forth above the mountains, snapping photographs which were then pieced together into a mosaic. Engineers studied this under a stereoscope, choosing the ten best sites, avoiding "live" faults, where earthquakes might bring slippage.

These dams are part of a bigger scheme to save the water by pouring it into the ground

[*Continued on page* 142]

Beautiful curves lend strength to the Big Dalton Dam which impounds drinking water for the Los Angeles County area.

"Mechanix Illustrated"

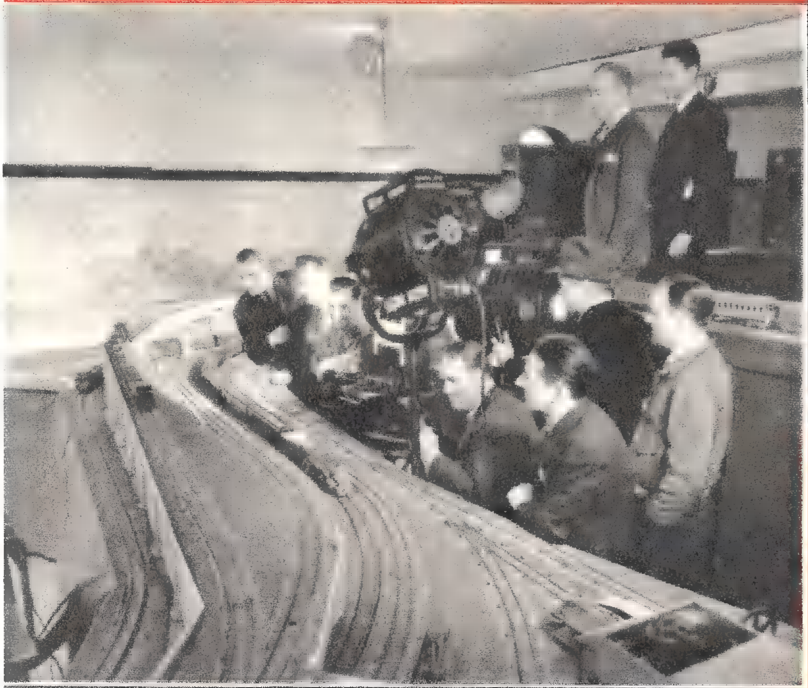
These pictures [redacted] representative of the effort and facilities put behind Vitaphone pictures. Above: A railroad sequence being "shot" [redacted] location. Below: "Hollywood-in-Brooklyn"; [redacted] of a huge sound stage in the Vitaphone studio in New York, where [redacted] than [redacted] hundred "shorts" are produced every year.

SOMETHING new and unusual in movie "shorts" will be offered to the public when the first of [redacted] series of Vitaphone-Mechanix Illustrated films is released soon to theatres throughout the country. Made in full natural color by Warner Brothers' Vitaphone Studio in collaboration with the editors of this magazine, these absorbingly interesting movies will take audiences into science's laboratories and industry's factories, and will show for the first time how many of the marvels of our modern civilization are conceived and produced.

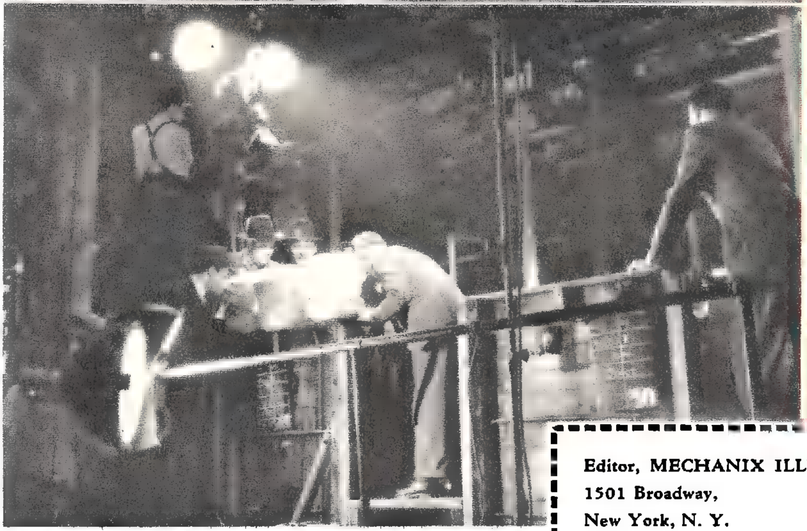
The films will run about ten minutes and each will deal with four specially chosen topics. However, months of preliminary in-

In The MOVIES

Vitaphone "Shorts" In Natural Color Will Be Unique, Interesting



Above: Sam Sax, head of Warner Brothers' Vitaphone Studio, Brooklyn, N. Y., under whose supervision the MECHANIX ILLUSTRATED films [illegible] being made.



The two pictures [illegible] the left show Vitaphone [illegible] [illegible] [illegible] the job. Top: filming the permanent model railroad built up by the New York Society of Model Engineers. Left: The color [illegible] records [illegible] wool dyeing operation in [illegible] factory. Setting up a heavy [illegible] and [illegible] battery of powerful lights sometimes takes hours, while the actual shooting may take only a few minutes.

Don't miss first Vitaphone-MECHANIX ILLUSTRATED film! Mail us the convenient coupon below [illegible] write [illegible] [illegible] postcard if you do not want to cut your copy of the magazine. No obligation [illegible] your part, of course.

vestigation and preparation have been put into them. Warner Brothers production experts and cameramen, accompanied by members of the Mechanix Illustrated editorial staff, visited many locations in their quest for colorful, human-interest material. and spent many hours on research before

[*Continued on page* 144]

Editor, MECHANIX ILLUSTRATED
1501 Broadway,
New York, N. Y.

I want to see the first of the Vitaphone-MECHANIX ILLUSTRATED Shorts. Please let me know when my local theatre .... (please fill in its name) will show it.

Name ....

Address ....

City

State

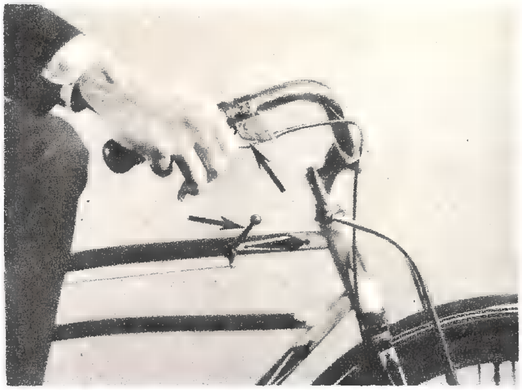
Rural Mail Box Tilts Open

AN AUTOMATIC rural mail box, which tilts forward when opened and allows the mail to slide into the cover where it is easily removed, has recently been invented by a resident of Minneapolis, Minn. The old type stationary mail box is sometimes difficult to empty from a wagon or automobile, but the new mail box is said to eliminate this trouble entirely. When the door of the new box is opened, the flag drops automatically, the box tilts forward as shown in the photo and the contents slides into the cover. Upon removing all the mail, the hinged cover automatically closes.

Builds 8-Foot Cottage Model

FEATURING a floor size of eight by ten feet and a height of about eight feet, a perfectly detailed model of a Cape Cod cottage was recently constructed by George Brink, of Waterloo, N. Y. The little house contains four rooms and a bath, hard-wood floors and is completely furnished with furniture also made by Mr. Brink.

The living room of the model home has a stone fireplace, the chimney running up the side of the house. Stone steps lead to the door of the house and, together with the gutters and little green blinds on the windows, help to create a real New England appearance.



Levers Control Bike Brakes

A FRONT wheel brake, operated from the handlebar and a two-speed rear wheel coaster brake, operated by a lever mounted on the frame, have been developed for bicycle use. The rear brake has a change speed gear which provides extra power on hills, quick pick-up, and more speed. Photo shows finger-tip controls.

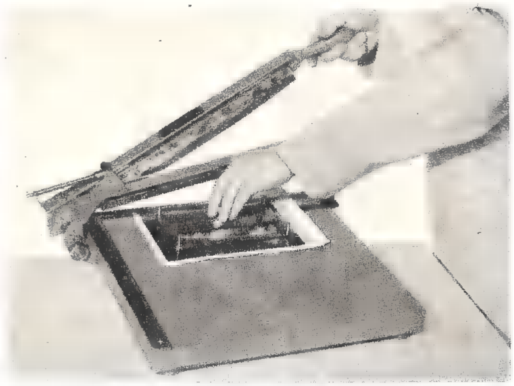


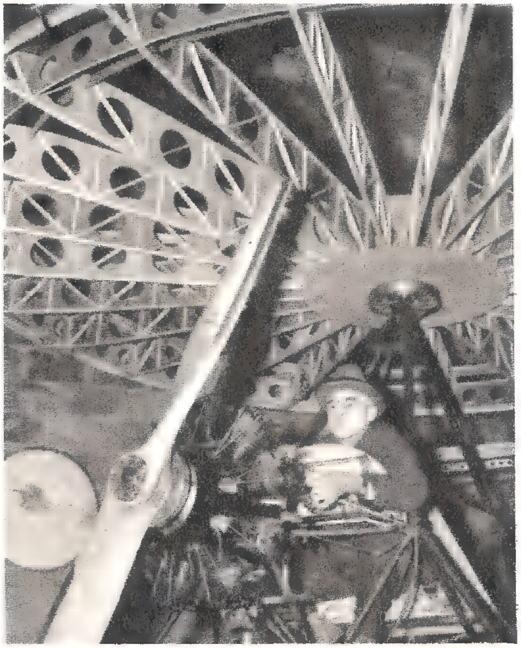
Photo Cutter Is Self-Honing

MOUNTED on rubber-tipped feet to keep it from sliding, a newly developed photograph trimmer features a patented hinge and suspension spring that holds its two knives in such a position that they rub against each other, honing the blades. The trimmer is equipped with a gauge that shows exactly where a photo is to be cut.

25,000 Bowlers Participate In National Contest

CLOSE to 25,000 bowlers, members of 5,000 five-man teams, recently gathered in Chicago, Ill., to attend the mammoth competition sponsored by the American Bowling Congress. The competition lasted for one and a half months and the prizes totaled $290,000. Because of the large number of contestants, the competition was declared to be the nation's most extravagant sports event. More than forty alleys were constructed at the contest site to accommodate the bowlers.

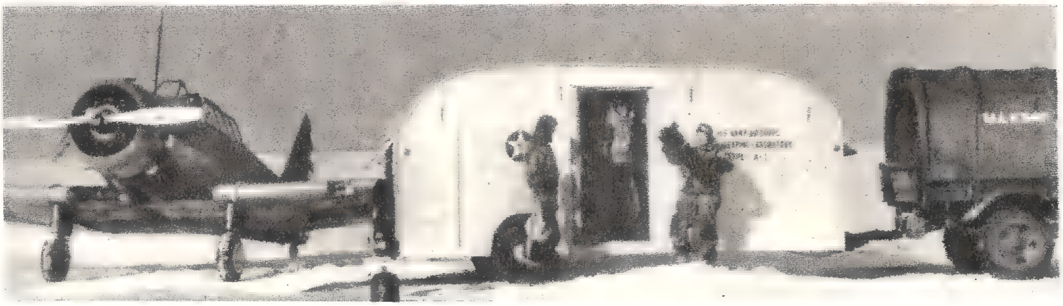
Invents "Disc-Rotor" Aircraft



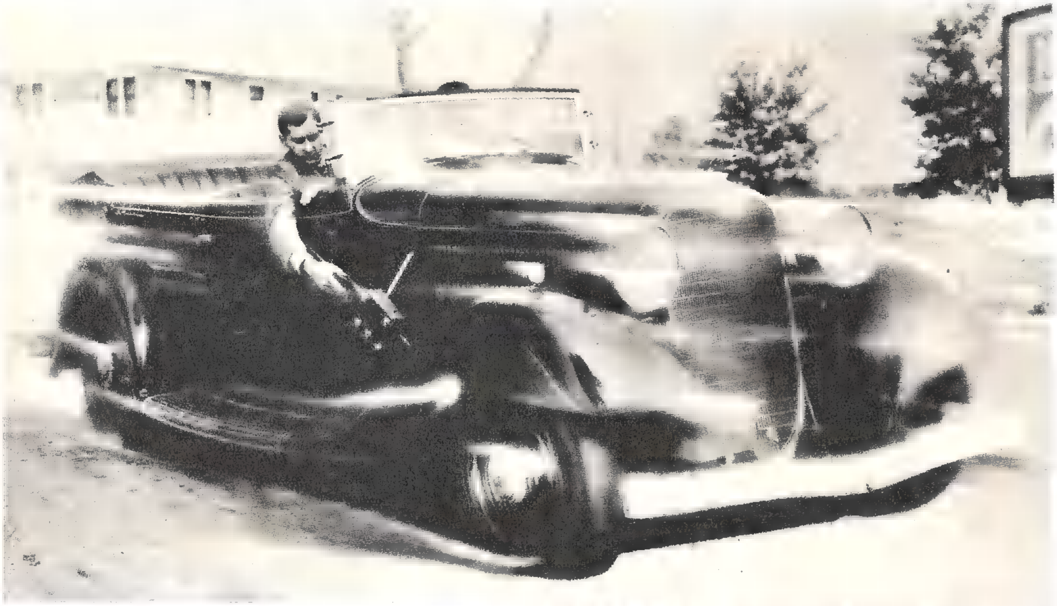
CLAIMED to combine the best features of the airplane and autogiro, a "disc-rotor" aircraft has been invented by J. S. Caldwell, of Washington, D. C. The new plane cannot tailspin or nosedive, according to the inventor. The craft's overhead disc-rotor is locked in place during flight, but rotates freely during landings, making vertical descents possible.

Trailer Photo Lab Developed

SHOWN below is a photograph of a service test of a new mobile photographic laboratory developed by the U. S. Army Air Corps. A plane has just landed "behind the lines" with negatives showing infantry maneuvers. Rushed to the darkroom, the negatives are soon developed and finished prints are handed to the pilot for delivery to regiments occupying "front line" positions.



Drive Next Year's



Blowouts or bumps mean nothing to a car when it is equipped with a hydraulic steering stabilizer. This device takes control of the wheel in an emergency and prevents the car from leaving its true course on the highway. Right—The stabilizer fastened in place.

WHETHER your car is a sparkling 1938 model or something which you are obliged to drive another year, it has never been easier to have a taste of tomorrow's motoring—now. The idea is suggested by the offering of an unusual number of ingenious and practical accessories. These new gadgets banish some of the ancient fears in driving, shorten the time required to keep the car up to par, and step up performance in a number of ways.

Do you drive in constant fear of a blowout? Are you annoyed by the penalty for forgetting to add water to the battery? Do you feel that the engine should give better performance, and would you care to try supercharging? Are you still changing engine oil every thousand miles? Do you envy those who are enjoying many new conveniences which you assume are available only on new cars? If so, step right up to the accessory counter and take your pick. Your 1939 car is ready!

Automotive engineers are looking over the present automobile with a view to seeing what new uses they can find for principles already employed. It was this policy that helped in the creation of a device that takes the hazard out of blowouts. If hydraulic shock absorbers control spring action, why not use a special shock absorber on the steering tierod? Why wouldn't this device effectively check the tierod's movement, in event of a front tire blowout, and prevent the steering wheel from snapping out of the driver's hand? When an automotive engineer asks "why?" he generally ends by providing the answer.

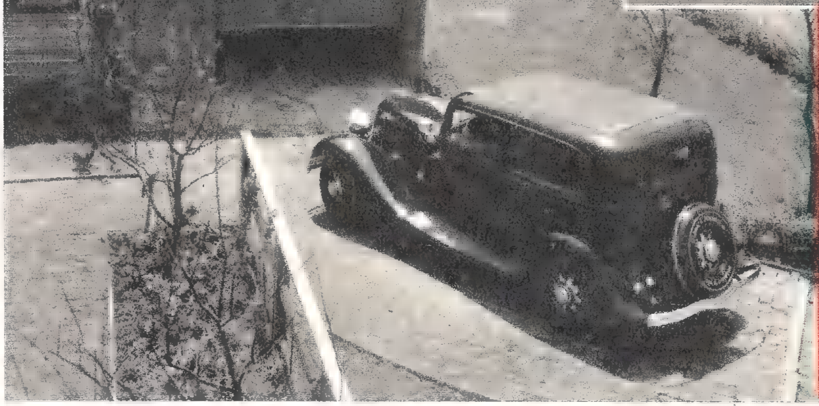
So a four-star accessory is born. With this large hydraulic hand on the car it is possible to strike a railroad tie with one of the front wheels while the car is traveling sixty miles

Car Today

by Frederick C. Russell

Ingenious new accessories will put your car a year ahead in comfort, convenience and safety.

This device provides air conditioning for the car. Using the cowl ventilator as an intake, it purifies, [illegible] and circulates air in the car. Tests have shown that this device is particularly helpful when the outside air is very dusty.

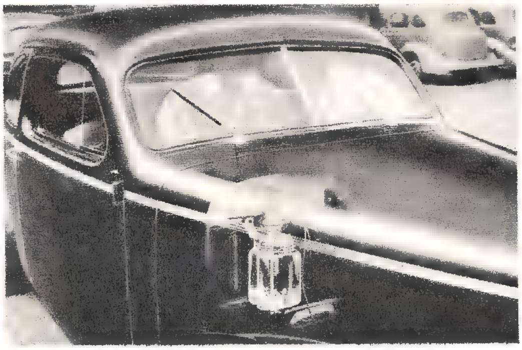


Imagine driving up to your garage, touching a button on the dash and having the doors open automatically and close when the car is inside. You can have this magic feature now. Why wait for it to become standard equipment?

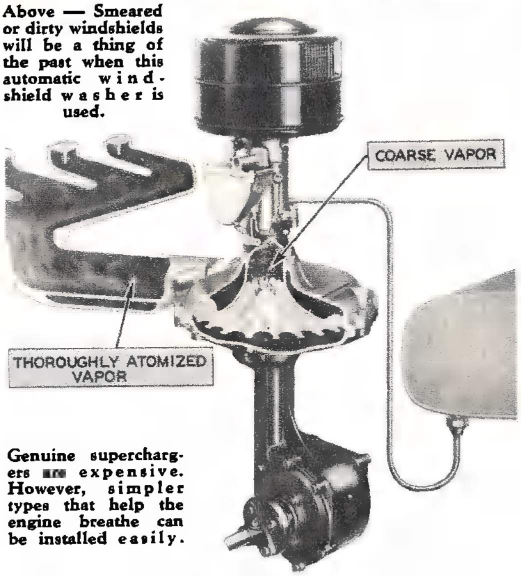
an hour—and live happily ever after, even if the driver takes his hands from the wheel! No one wants to try that stunt, but the steering stabilizer is built to give that much margin of protection. Whether the car's stability is endangered by road obstruction or by tire collapse it continues in a straight-ahead direction unless the driver finds it necessary to steer to the right or left. Tomorrow's car will have this protection, but you can have it today.

Solving the problem in a somewhat different way is the special inner wheel which serves to prevent that dangerous drop which occurs when a tire blows. The inner wheel takes over the job of supporting its end of the car until the driver has a chance to slow down and stop. Instead of dropping the dangerous distance to the rim the troublesome wheel drops only an inch or so to the edge of the safety inner wheel. Even though flat as a pancake the tire cannot offer that terrific resistance which usually is sufficient to throw a car out of control.

With either or both of these devices on the car, and with those special inner tubes which are being offered by major rubber companies, the fear of sudden tire collapse is definitely out of the picture for any motorist who wants his future motoring today. These safety inner tubes do away with the annoyance as well as danger from punctures. There is no particular magic about it. The thick center section of such a tube is turned



Above — Smeared or dirty windshields will be a thing of the past when this automatic windshield washer is used.



Genuine superchargers are expensive. However, simpler types that help the engine breathe can be installed easily.

inside out so that when punctured the rubber closes in around the sharp object or fills up the cut left when the object is withdrawn. One of the tire companies recently announced a new chemical which, when injected into the inner tube with a special pressure gun, will cause punctures to close up immediately and permanently. Rotation of the wheel spreads the coating evenly. The protective coating remains in place as long as the tire stands, and it will not clog the valve.

The whole appearance of the car can be changed by a process of retrimming the hood and sides of the body. Fresh air advocates can have the sunshine tops installed in their present cars. Now that this familiar taxicab feature is available for all cars even the man with a sedan can enjoy a convertible feature that will doubtless be standard equipment in the years to come. More radical is the new control system which consists of full power brakes, clutch and throttle, operated by vacuum cylinders which are, in turn, operated by a control wheel. This special wheel is mounted just below the steering wheel on a collar which allows it to rotate freely and to be carried with the steering wheel when turning. It also slides up and down the column, this special motion controlling the valves and thus the car. Designed especially for paralytics and others who have the misfortune of not being able to use their feet when operating a car, this highly efficient

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A new wheel safeguard makes it possible to continue driving after a blowout without damage to the tire or the wheel.

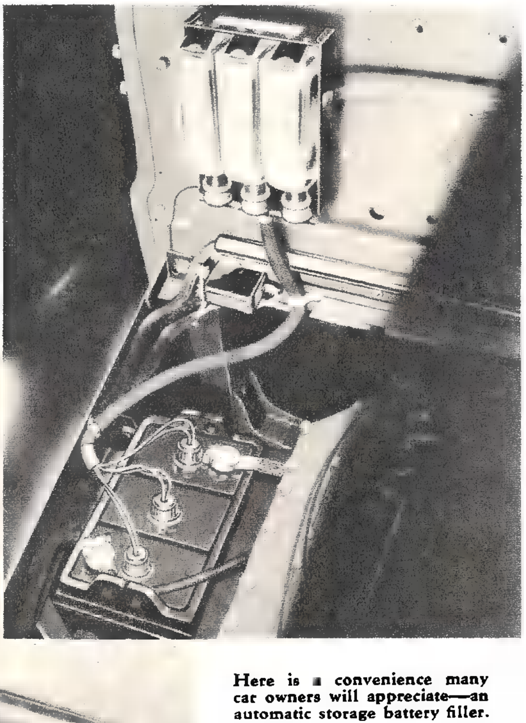
and extremly simple control system may eventually hasten the demise of all foot controls.

Last year this system looked unwieldy because the average driver shied at the idea of having anything in the way of a control under the steering wheel. Today, with so many of the 1938 models featuring remote controls for shifting gears, the system looks far less unusual. Tomorrow it should look as simple as hydraulic brakes, but why wait until tomorrow?

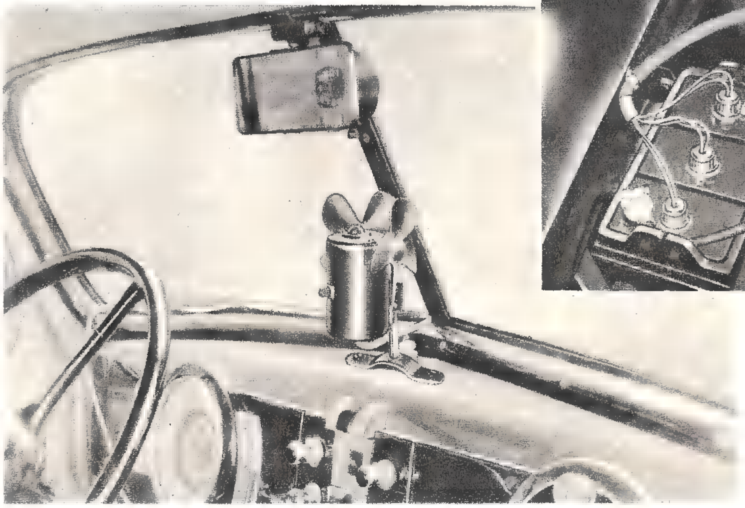
For those who want to take the step in installments, why not consider a power brake booster? Such a device operates from engine intake vacuum. Its piston draws on the brake pedal arm and thus can be used with either mechanical or hydraulic systems. A control knob attached to the rim of the steering wheel will aid in handling the car in traffic or in parking. The horn ring, which has become so popular with today's car, can be attached to any of the cars manufactured within the last few years. It is fitted to the inner part of the horn control, the button proper being replaced when the ring is attached. This is a great improvement over the former method of using a suction cup to hold the ring in place.

In the line of new controls perhaps the most unusual is the rear-door safety lock which comes as a blessing to parents who happen to own cars of the four-door type. Children fidgeting around the tonneau cannot open the doors while the car is in motion nor until the person at the wheel releases the special remote control lock. The idea has other uses. There is greater convenience in locking and

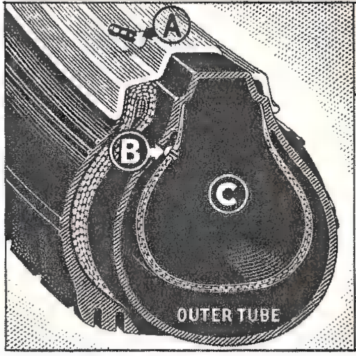
No longer is it necessary to get out of the car to adjust the "buggy whip" antenna. This new type can be raised or lowered quickly and easily from the inside.



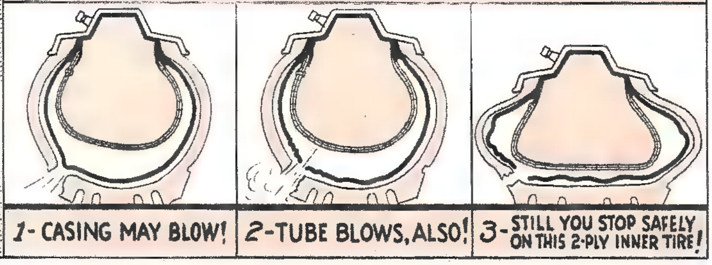
Here is a convenience many car owners will appreciate—an automatic storage battery filler.



Left—Small metal weights are inserted in the rubber blades of this defrosting fan to remove all excess vibration.



Top—A demonstration car, equipped with special tires, about to run over spikes to cause blowouts. Below—A cutaway drawing of a tire having unusual safety features. In the diagram, "A" indicates the valve stem, "B" is a vent hole, and "C" the inner air chamber which will support the wheel even though the casing and tube has blown.



unlocking the doors, and locking out a would-be intruder is short work. Since the doors cannot accidentally fly open there are other advantages to this control system which anyone who has ever ripped off a door will appreciate.

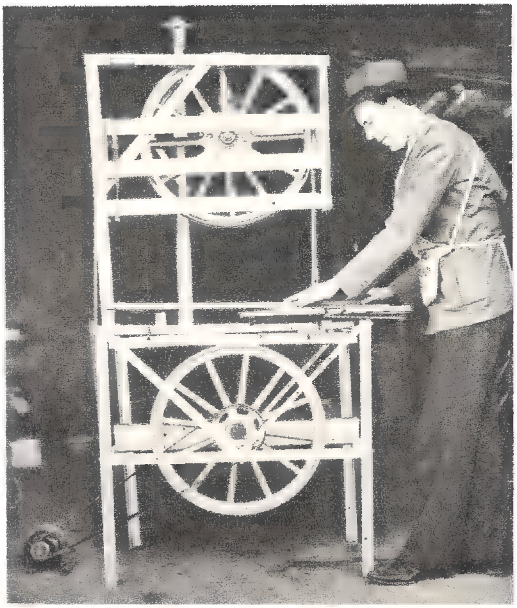
Does this sound like something that would be about as cheap as buying a new car? Well, here's good news: a pair of these rear-door locks sells for less than five dollars. Another gadget that should prevent many accidents is a button control for selecting radio programs. Instantly you can tune your car receiver to any one of six favorite stations. You do not have to take your eyes off the road, because it is easy to learn the position of the buttons and you can easily feel them even in the dark. Cars of tomorrow will all carry automatic station selectors, but you need not wait for this. The convenience and safety of button tuning is here now.

Unusual is the newest of the wide assortment of buggy-whip radio aerials for the car. You have doubtless seen, and perhaps tried, the type that is adjustable as to length, but now there is one that can be raised and lowered without the necessity of reaching out the window or leaving the driving compartment. It is attached to the instrument panel, its tip passing up through the car's roof. Another welcome idea is the special mirror which clamps to the top hinge of the left front door. Its function is to give you vision to the rear in that special "blind spot" formed by the rear panel of the body. Looking into this special mirror you have the impression of being able to see behind as easily as if the car were a roadster with the top down.

Have you, among other things, ever stopped to wonder what would happen if your car upset and the engine continued to run? You might easily escape injury as a result of the upset, for the modern all-steel top is a remarkably strong piece of construction, but with the engine running and gas and oil spilling all over it there might easily be a fatal epilogue in the form of a fire. This can be avoided by installing a simple little protection switch which automatically turns off the

[*Continued on page* 149]

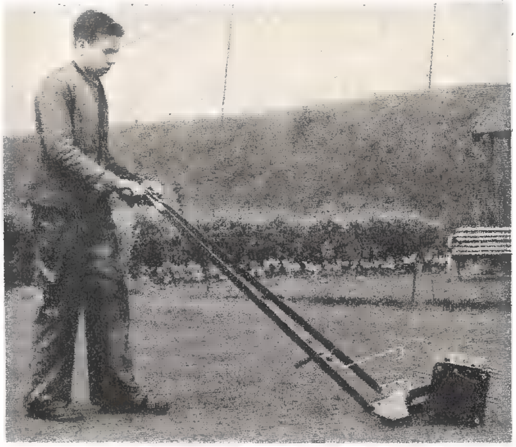
Carpenter Builds Bandsaw From Old Automobile Parts



MAKING wood working machinery out of discarded auto and electrical parts is the hobby of W. S. Wagner, a carpenter in Grand Island, Nebraska, who recently completed the construction of a heavy-duty bandsaw. The machine cost only $18 to build and cuts wood up to four feet wide.

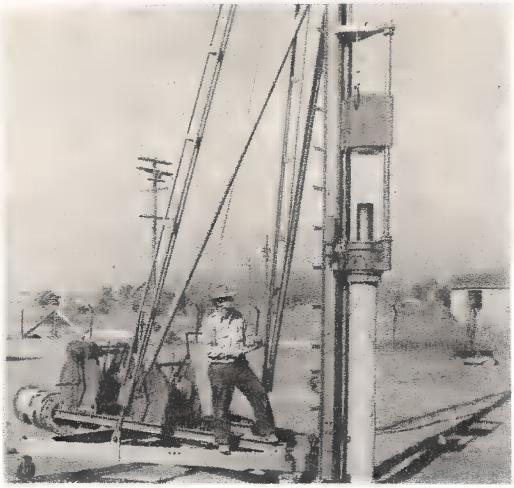
For the frame of his home-built bandsaw, Wagner converted a couple of old bedsteads. An automobile differential was used as a support for two wheels around which the bandsaw revolves, the wheels themselves being taken from an obsolete automobile. He then secured a one-half horsepower electric motor from an old washing machine and connected it to the wheels by means of a belt. The saw has a throat of 28 inches, which is considerably larger than the average.

Machine With Spiked Frame Aerates Lawn Soil



A RECENTLY developed machine simplifies the job of aerating the soil beneath a lawn. The machine features a series of steel spikes attached to a square frame in such a manner that when it is pushed over the lawn the steel spikes are forced into the ground. As the frame turns, a new series of spikes makes more holes in the ground thus making it easy for air and water to enter. One person can operate the machine and cover a large area in a single day's work.

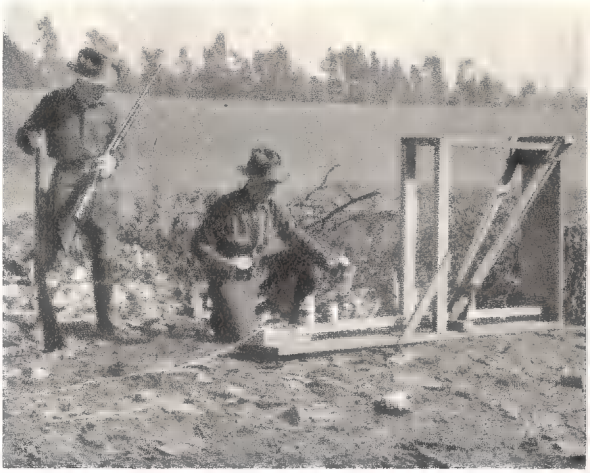
Portable Pile Driver Works Like Diesel Engine



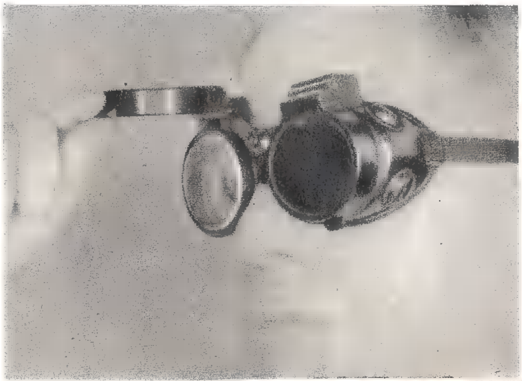
EQUIPPED with a light tripod mounting, a newly developed portable Diesel pile driver features a 660-pound hammer that strikes a blow of 3,630 pounds at a rate of fifty to seventy times per minute. The device operates all day on three quarts of fuel oil, costing about six cents.

When released, the hammer falls upon a heavy block with a piston protruding upwards. Air in the cylinder is compressed by the hammer's fall and, at the same instant, fuel oil is ejected. The resultant explosion throws the hammer into the air again. The hammer stroke varies from 2½ to 5 feet.

Home-Built Catapult Lowers Trap Shooting Costs



AT A COST of only one dollar for lumber, two California trap shooting enthusiasts rigged up a catapult which, as shown in the accompanying photos, hurls old tin cans into the air as a substitute for clay bird targets.

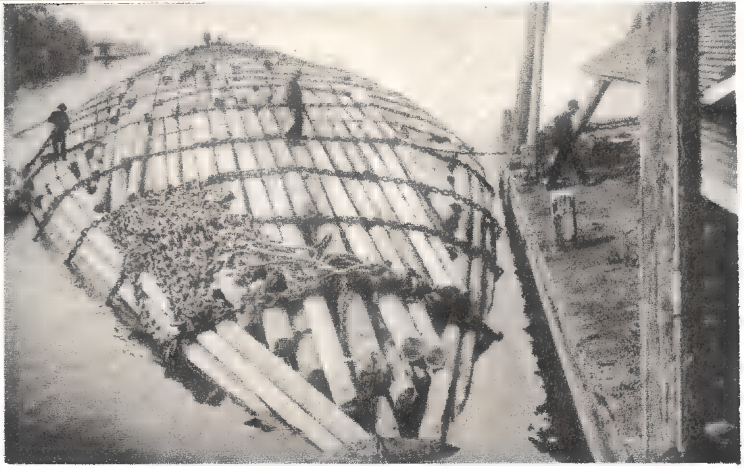


Welders' Goggles Feature Hinged Lenses

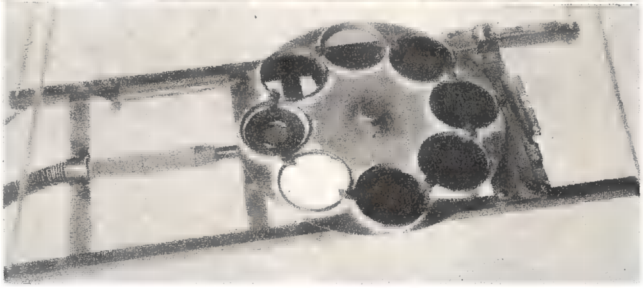
DEVELOPED for use by welders, goggles designed by a Reading, Pa., manufacturer feature colored lenses hinged over clear lenses so that they can be raised to permit the welder to inspect his work. The colored lenses are designed to protect the eyes from the infra rays of the welding arc.

"Sea Monsters" Are Log Rafts

RESEMBLING huge marine monsters, rafts consisting of thousands of logs bound together with chains totaling 175 tons in weight are a common sight on the Columbia River in Oregon. The logs comprising the rafts are sold to numerous paper mills and lumber firms en route.

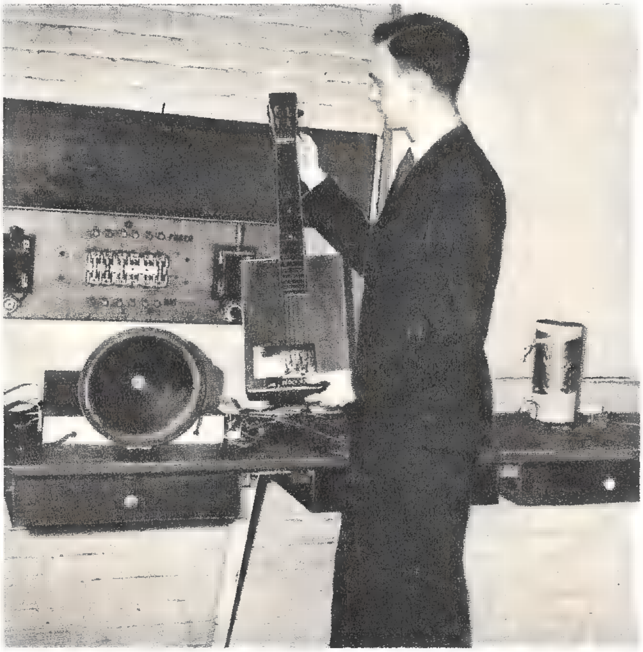


New Device Measures Transparency Of Lake Waters



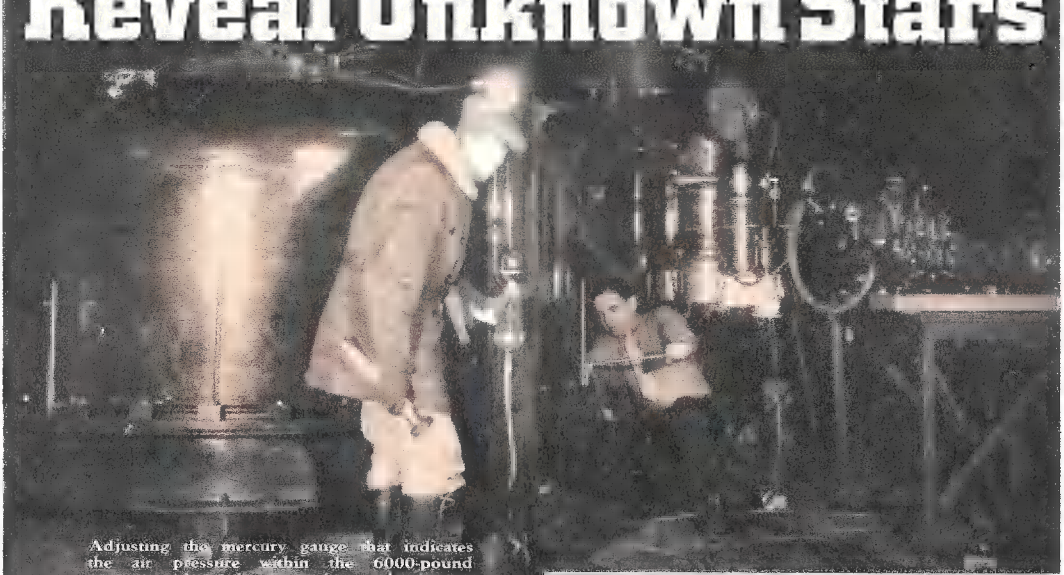
THE instrument shown at the right measures the passage of solar radiation through lake waters, furnishing a basis for the addition of fertilizer to bring about a more abundant growth of plant life for the propagation of fish. The sun's rays striking the instrument cause a reading on a meter in the boat.

Student Constructs Loud Speaking Electric Guitar



CARL WISCHMEYER, Yale engineering student, is shown with an electric guitar he constructed. For use on regular house current, it is claimed to have better tone and more volume than the conventional type instrument. At the left is shown the loudspeaker and amplifying equipment used for producing varying degrees of volume, from a mere whisper to the maximum possible with this particular amplifier. With equipment such as this, a musical instrument can be given a voice loud enough to be heard for miles, if desired. Instruments of this type are becoming increasingly popular in dance orchestras, because normally soft voiced instruments can be made as loud as conditions require. Played like a conventional guitar, volume is increased merely by turning up the volume control.

ALUMINUM MIRRORS Reveal Unknown Stars



Adjusting the mercury gauge that indicates the air pressure within the 6000-pound vacuum chamber used in aluminizing mirrors of large astronomical telescopes.

Above—The glass mirrors are moved with special apparatus.

Adjusting the pumps that reduce the air pressure within the aluminizing chamber to one-millionth of outside pressure.

Examining some small mirrors that have been given a new reflecting surface. The vacuum chamber is first tested out with small mirrors before larger ones get their "shot" of aluminum.

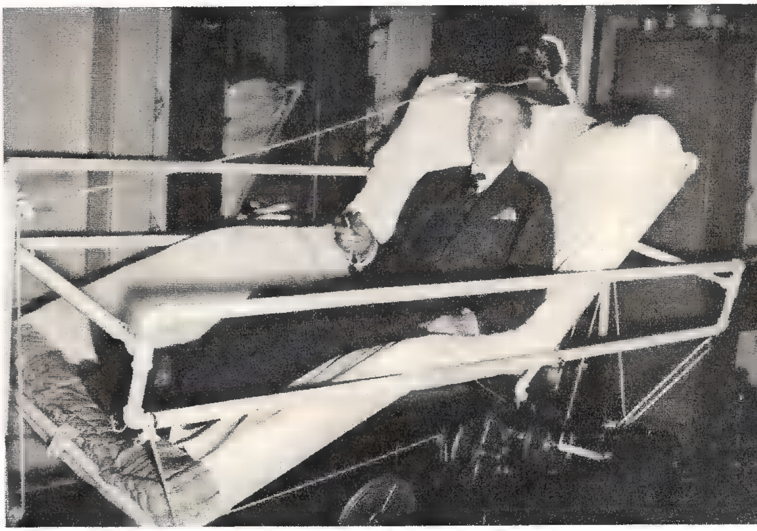
A NEW aluminizing process by means of which a film of metallic aluminum only four-millionths of an inch thick is applied to the mirrors of astronomical telescopes, is said to increase the efficiency of the telescopes, making it possible to reflect the invisible ultra-violet light of stars much better than silver-covered mirrors. The aluminum is applied to the mirrors by placing them in a sealed chamber from which the air is evacuated for eight hours while an electric current, passing through tungsten wire, evaporates two small pieces of aluminum over the surface of the mirrors.

Mailbox Picks Up, Delivers Mail

EQUIPPING an ordinary rural type mailbox with a small electric motor and mounting the box on pulleys to permit its passage over trolley wires, R. H. Bess, a rancher in Downey, Calif., devised a mail pick-up system that saves him a half-mile walk every day. By pressing a button in his home, the rancher causes the electrically powered mailbox to leave his porch, travel down the trolley wires to the roadside and return with mail after it has been deposited by the postman. Bess is said to have applied for a patent on his traveling mailbox, which is shown in photo at right.

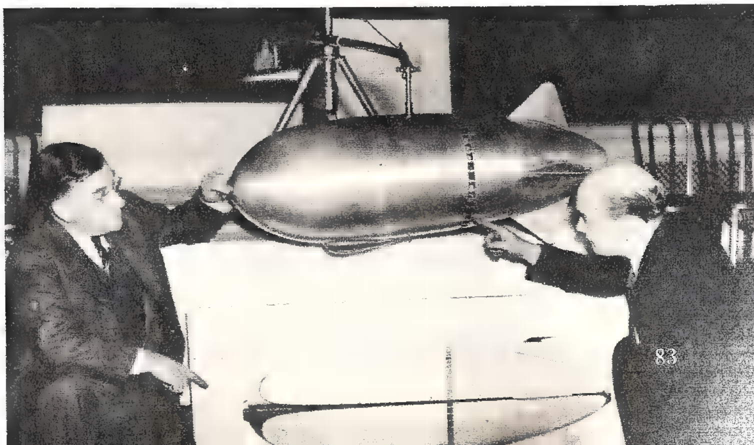
Mechanical Bed Is Boon To Patients

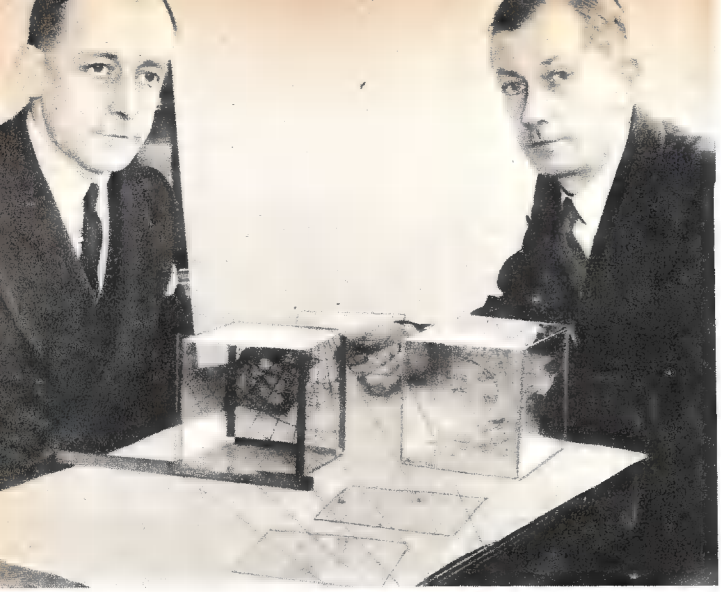
DESIGNED primarily to eliminate bed sores, the bane of all bedridden patients, a newly developed mechanical bed gently rolls a helpless patient on his side—right or left—or raises him to a sitting position at the mere pressing of a button held in his hand. Developed by Dr. C. E. Sharp, at the Ohio State University laboratories, the mechanical bed is actuated by a small electric washing machine motor connected to a pulley system.



New Type Airship Flys By "Kicking"

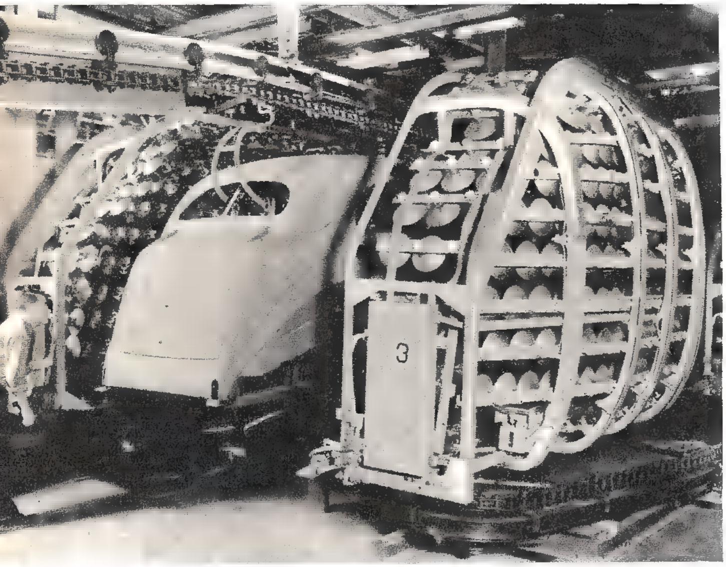
A MODEL of a new dirigible was recently placed on exhibition in Washington, D. C. The dirigible design features a novel method of propulsion whereby air sucked through a tube is ejected at the stern, providing a propulsive "kick."





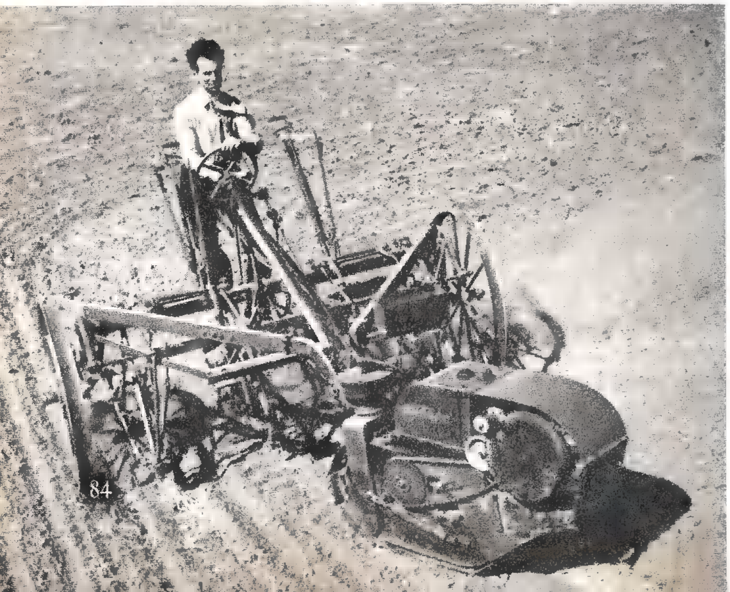
Transparent Weather Chart Aids Flyers

INVENTED by Kenneth and Dennis Bartlett, of London, England, a new three-dimensional aviation weather chart is said to make it possible to chart weather conditions at various altitudes over the 2,000-mile flying route between Ireland and Newfoundland. The chart consists of a six-inch, cubic, transparent box which is fitted with shelves to represent different altitudes. Imperial Airways will test the chart on experimental flights.



Enamel Baking Lamps Resemble Clam Shells

REPLACING conventional bake ovens, "clam shells" equipped with hundreds of infrared ray reflectors are now being used for baking enamel on automobile bodies in the plant of a car manufacturer in Rouge, Mich. Mounted on conveyors, the shells fold around the automobile body and proceed with it to the end of the baking line, providing constant, controlled heat throughout the entire baking process, thus insuring an even coating and hardening of the enamel on the body.



Stubby Farm Tractor Has Single Tread

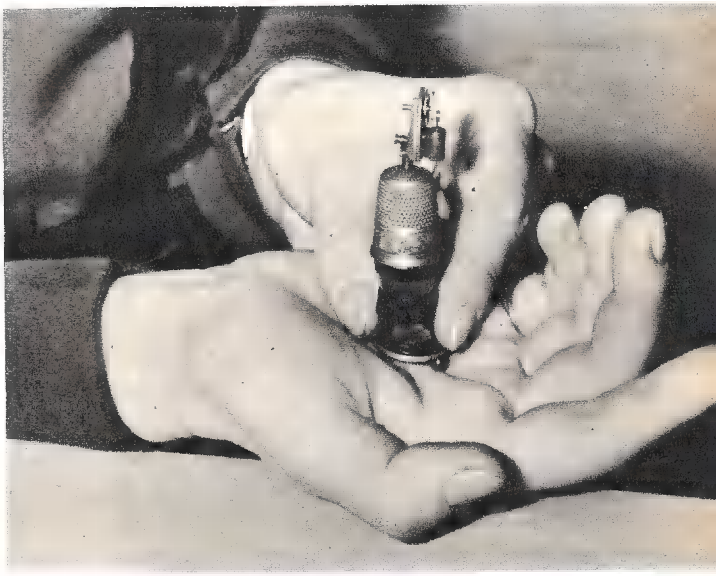
CONSUMING only half a gallon of gasoline per hour, a newly developed farm tractor features a single tread mechanism which is powered by a two-cylinder motorcycle engine. Designed to replace a team of horses, the stubby tractor is easily handled and can be turned in very small circles. The machine has a wheeled drawbar which can be replaced by any standard farm implement.

Carves Scale Model Of Ocean Liner

REPRESENTING nearly 12 months work with knife, wood and thread, a three-foot model of the *Queen Mary* ocean liner has recently been completed by F. Ratcliffe, of Cheshire, England. The model was carved to scale from measurements determined by a careful study of photographs of the gigantic passenger liner. The model liner is Mr. Ratcliffe's latest effort, but he has also carved excellent tug and barge models, as shown in photo.

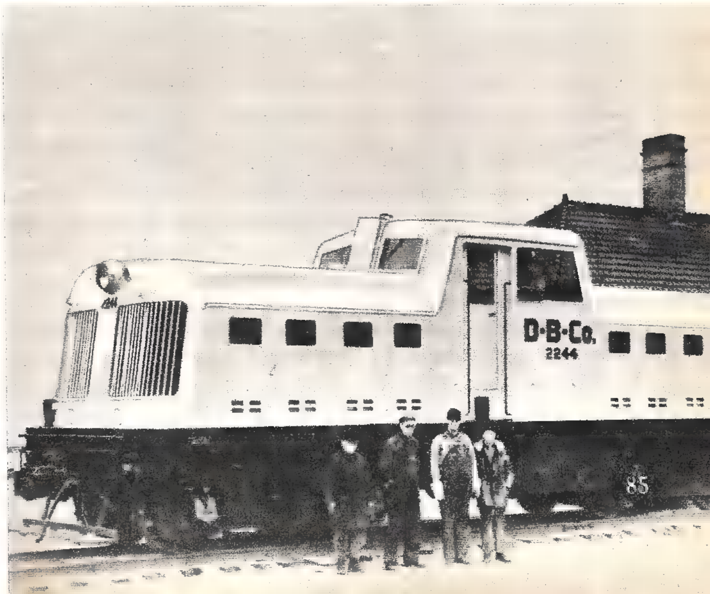
Midget Steam Engine Has Thimble Boiler

SO SMALL that it can be concealed in the palm of the hand, a novel working steam engine recently placed on exhibition in New York, N. Y., features an ordinary small-sized sewing thimble as its boiler. Because of its diminutiveness, the flywheel, piston, connecting rod and other parts of the steam engine had to be specially constructed. Despite its compactness, the engine is said to be powerful enough to drive several small toys.



Switching Locomotive Has Four Engines

POWERED by four Diesel engines, any one or all of which may be used according to the load, a new type of railway engine is said to provide an economical means of switching a few cars or an entire train. Constructed by a Davenport, Iowa, firm, the new engine weighs 102 tons. To reverse direction, the engineer simply moves from controls at one side of the cab to the other.



War POSTMARKS AS COLLECTOR ITEMS

by

Montgomery Mulford

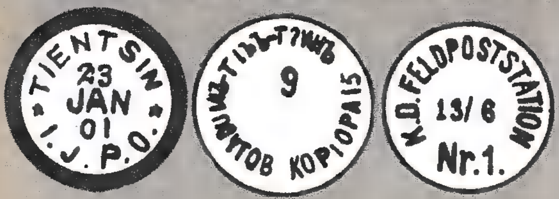
THE first regular mail postmarks were adopted in England by William Dockra in 1661, and used until 1787. Since then, postmarks have been essential to mark or cancel mail, and will be seen to be generations older than adhesive postage stamps.

When armies went into the field, it was found that postmarks of special kinds had to be made, showing the source of letters. It is said that the first military, or war postmarks, appeared during the Crimean War. Since then, armies in the field have generally had their own individual postmarks, many of which are collectible items today, some quite rare. There are a number of World War postmarks which are quite elusive now, although common in 1917-18. Rarity, in most instances—as in the case of the World War particularly—has resulted from the fact that "the folks back home" seldom preserved the soldiers' letter envelopes, although the letters themselves were treasured for sentimental reasons.

When an army takes over a section, or occupies a place—whether a city or an entire country—postmarks are necessary. Thus the Chinese Boxer Rebellion of 1901 resulted in several postmarks, now sought after eagerly. This article pictures three types, from Japan, Russia, Germany. Thus, also, when the German armies occupied such countries as Belgium or Rumania, special postmarks were again essential to mark and cancel mail from the armies of occupation.

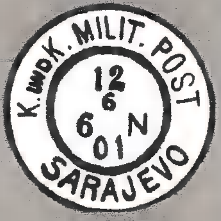
The postmarks of the Teutonic World War armies are quite fascinating, and numerous in types. This is because special postmarks were provided for various services on the march or in stations. The guard, the infantry, the cavalry, and other sections of the army had their own distinctive markings. The headquarters of the High Command also had

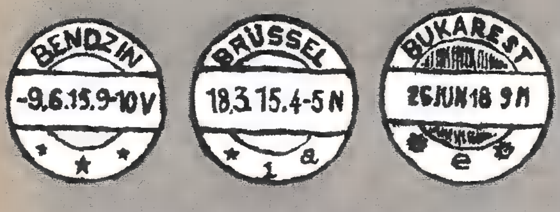
[Continued on page 140]



Shown above are Japanese, Russian and German military postmarks which were issued during the Boxer Rebellion.

Many military postmarks possess great historical interest. Shown at the right is an Austrian-Bosnia Field Postoffice postmark which was issued at Sarajevo, where the World War began. Regular mail postmarks date back to 1661, but military types first appeared during the Crimean War, which started in 1854.

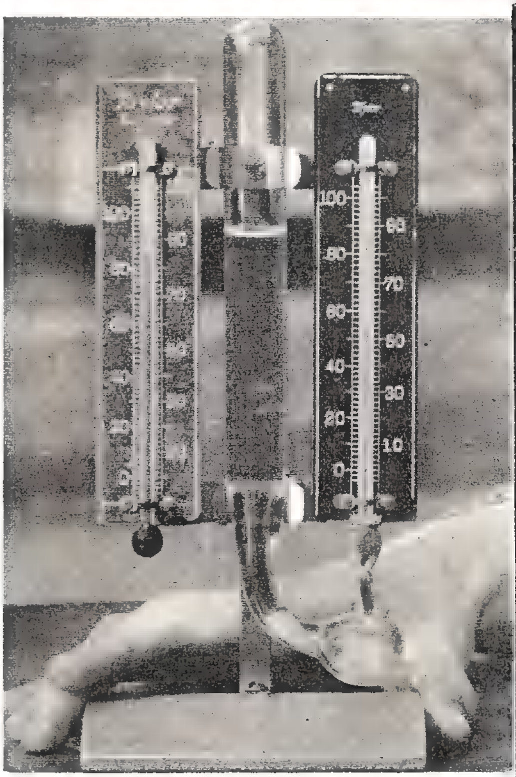




To expedite mail service for armies of occupation, postmarks are usually issued in place of stamps. Above—Three German military postmarks issued during the World War. Some war postmarks are quite rare.

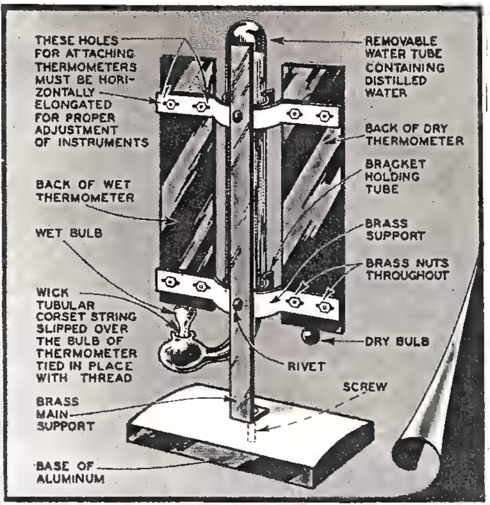
CRAFTS and HOBBIES

by
John Edwin Hogg



WET AND DRY BULB THERMOMETER FOR 75c

ONE of the most interesting and useful of weather instruments is the dry and wet bulb thermometer. It is the only type of thermometer which means anything to those who realize the vast importance of temperatures and their relationship to dryness and humidity. In the middle-West, for example, summer heat becomes almost unbearable above 90 degrees (F) with the intense humidity that follows a thunderstorm, while a temperature of 120 degrees causes little discomfort in the bone-dry atmosphere of Death Valley. The old superstition that thunder causes milk to sour was born of failure to recognize that thunderstorms — not the thunder itself—usually brings the condition of temperature and humidity that actually does sour the milk. Temperatures are one thing and temperatures with relation to dryness and humidity are quite another. Thus the readings of the dry and wet bulb thermometer make a world of difference to the rangers who are fighting a forest fire, to the farmer, the shipper of perishable goods, the retail grocer, the photographer and anyone else who may have a greater interest in the subject than his own physical comfort.

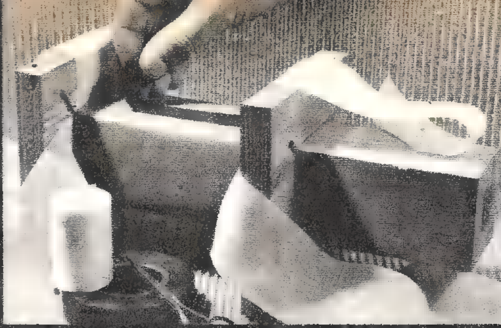

THESE HOLES FOR ATTACHING THERMOMETERS MUST BE HORIZONTALLY ELONGATED FOR PROPER ADJUSTMENT OF INSTRUMENTS
BACK OF WET THERMOMETER
WET BULB
WICK TUBULAR CORSET STRING SLIPPED OVER THE BULB OF THERMOMETER TIED IN PLACE WITH THREAD
BRASS MAIN SUPPORT
BASE OF ALUMINUM
REMOVABLE WATER TUBE CONTAINING DISTILLED WATER
BACK OF DRY THERMOMETER
BRACKET HOLDING TUBE
BRASS SUPPORT
BRASS NUTS THROUGHOUT
DRY BULB
RIVET
SCREW

Before starting construction, obtain two thermometers having similar readings. The glass tube to hold the water can be purchased

[*Continued on page* 143]

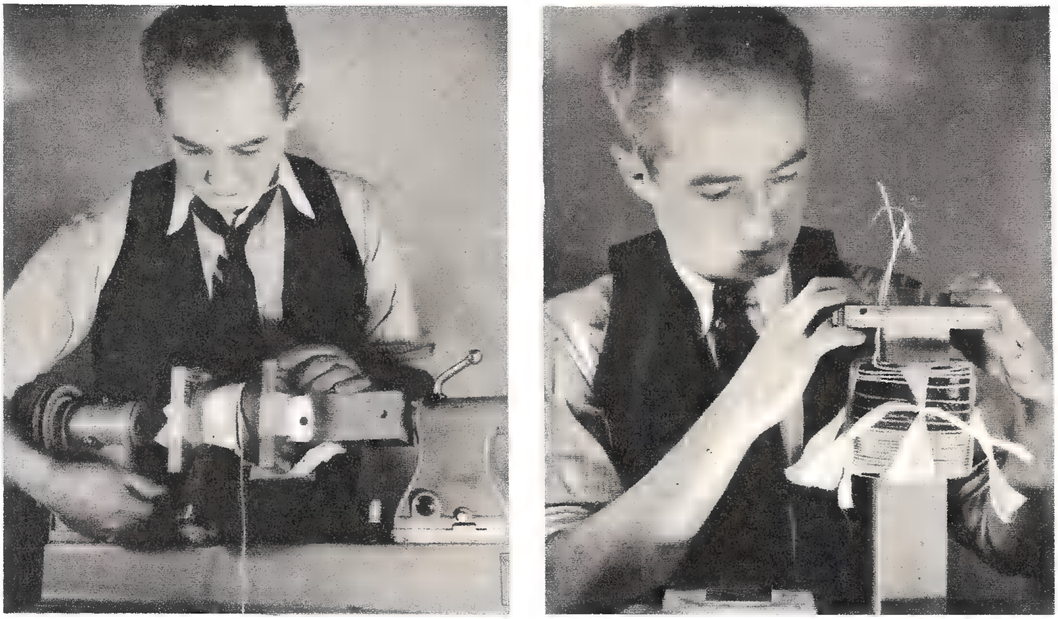
WOODWORKING · RADIO · METALCRAFT · AUTO HINTS · CHEMISTRY
SPORTSMEN'S CAMPFIRE · HOME AND SHOP PROJECTS · HANDIKINKS

A total of twelve pounds of wire is required for both coils. The primary uses six pounds of No. 12 single cotton covered enamel, and the secondary six pounds of No. 10 wire of the same type.



Several thicknesses of paper are held to the core with a piece of friction tape. Note strips of gauze, which facilitate removal of the core.

The "Mechanix Illustrated"



Left—Tap each layer of wire neatly in place with a rubber or wood mallet. Right—By tapping the end of the tapered wood core on a hard surface, coil will slide off easily. Ends of gauze strips are tied to hold windings intact.

FROM an examination of the design of the MI Arc Welder you will see that its principal features are simplicity of construction and low cost, but you will have to hold the electrode in your hand and give it an actual trial in order to realize the amount of sizzling, crackling heat it will generate.

The cost of building a welding transformer is in close ratio to the amount of current it will deliver without overheating. For example, you would need about 36 pounds of wire for one rated at 2,500 watts, and only 12 pounds of wire for one of one-third that capacity. When the former is used for light work, a reactance coil is needed to reduce the amount of current. Having in mind the needs of the man in the home workshop, the M I Arc Welder was designed exclusively for light work. It consumes less than 1,000 watts and therefore can be plugged into almost any 110-volt a.c. socket. It does not require the further expense of an auxiliary reactance coil. In addition to doing light welding, it is excellent for quickly soldering large work. The voltage is low so that even a child cannot receive the slightest shock. Finally, unlike outfits of larger capacity, it may be used continuously without overheating; ordinarily it will barely become warm.

For the primary and secondary coils of the transformer you will need a full 6 pounds each of No. 10 and No. 12 S. C. E. (single

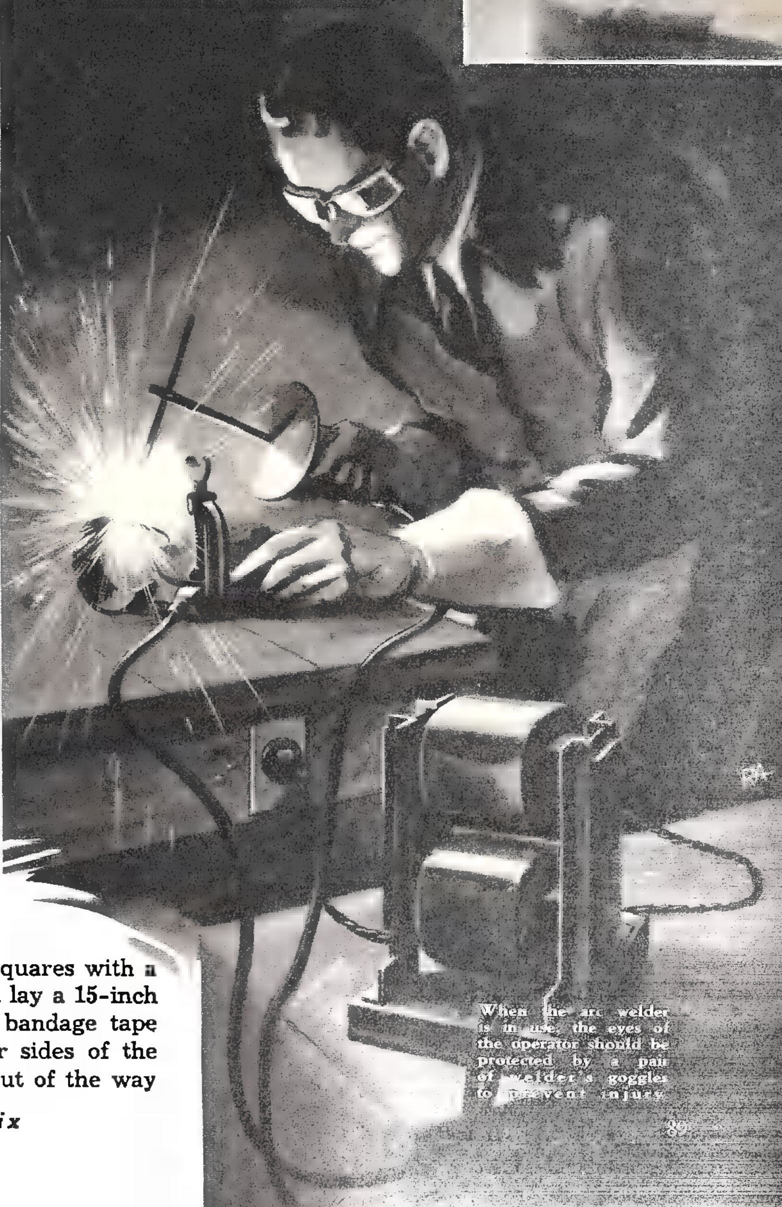
Left—Covering the coil with cotton gauze. The outside of each coil then is coated with white shellac. Right—The three wires from each end of the secondary are soldered to the heavy electrode and ground cables.

ARC WELDER

by Kenneth Murray

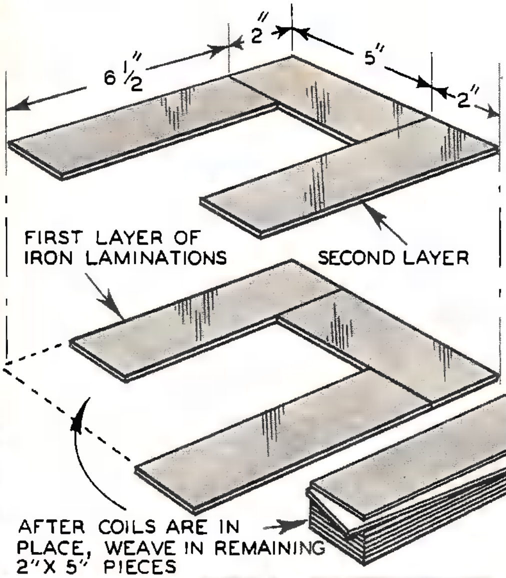
cotton enamel) magnet wire. The primary coil consists of 300 turns of the No. 12 wire and when in place over the iron core of the transformer it is connected directly to the 110-volt, 60-cycle alternating current line. The secondary coil consists of three coils of 60 turns each of No. 10 wire, which are wound one over the other and the ends of each then connected in parallel. This delivers the heavy current necessary for welding.

The winding form consists of a 12-inch length of wood that is 2¼ inches square. Taper it slightly towards one end, so that the finished coils can be slipped off easily. Then sand it smooth and apply a coating or two of wax. In order to confine the coils to a width of 4 inches you will need two 5-x5-inch squares of wood, one of which is screwed to the larger end of the form. Cut a 2¼-inch square hole in the center of the other and slip it over the form so that it is 4 inches from the first, then wedge or screw it tightly in place. Cover that part of the form between the squares with a thickness of waxed paper, then lay a 15-inch length of 2-inch cotton gauze bandage tape lengthwise of each of the four sides of the form. The ends can be held out of the way



When the arc welder is in use, the eyes of the operator should be protected by a pair of welder's goggles to prevent injury.

Top—Building three sides of the core. When this step is completed, the closed end is bolted between the angle-iron supporting pieces. Above—To make a tight fit, the iron core is partially covered with friction tape before slipping the coils in place.


6 1/2"
2"
5"
2"
FIRST LAYER OF IRON LAMINATIONS
SECOND LAYER
AFTER COILS ARE IN PLACE, WEAVE IN REMAINING 2"X 5" PIECES

The remaining pieces of iron are woven into the open end of the core and then bolted between the two angle-iron supporting pieces, as shown above.

with thumb tacks; their purpose, when the ends are later tied together, is to hold the turns of the completed coil in place. Three turns of 4-inch wide heavy wrapping paper are then wound in place and held with a strip of friction tape.

If you have a lathe, the form can be set up as shown, otherwise drill a hole in one end and slip it over the end of piece of pipe or metal rod that is firmly fixed, so that it turns easily.

Start with the primary coil by passing about 5 inches of the No. 12 wire through a hole drilled next to the form in one of the wood squares; then turn the form slowly while winding the wire in place neatly. Tap it at the corners to assure a neat bend. The space available will allow about 40 turns per layer if they are wound tightly together. Give the first layer a coat of white shellac, cover it with one thickness of heavy wrapping paper, and continue with the next. Seven-and-a-half layers will be required for the 300 turns. Then bring the end of the wire out alongside the beginning. Tie the ends of the four cotton tapes together tightly, remove the loose wood square and jolt the end of the form lightly. The coil will slide off evenly.

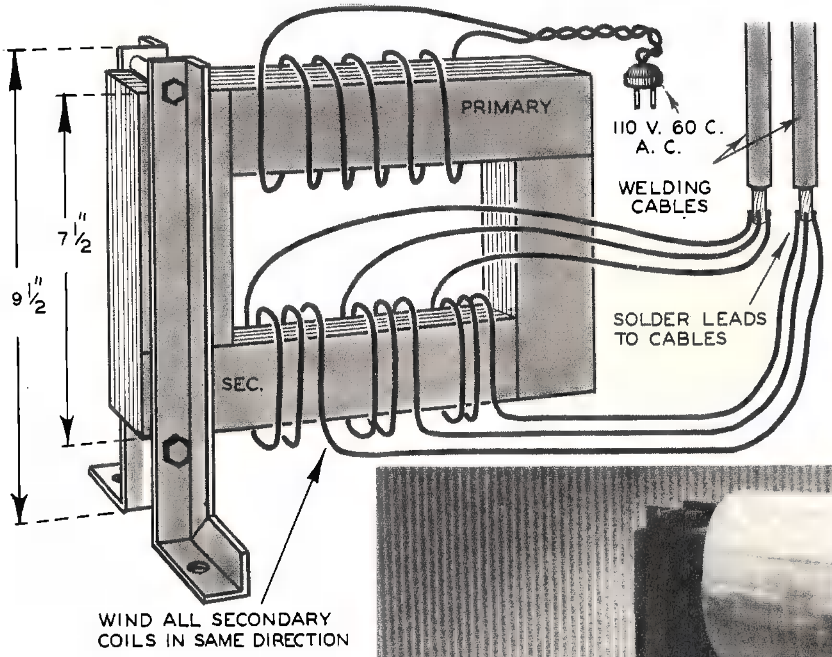
The secondary is wound in a similar manner, but in three coils of 60 turns each. Because the space will allow only 30 turns of No. 10 wire per layer, each 60-turn coil consists of two layers of 30 turns each, the ends of all three issuing at one side. When the windings are completed, bind the lead wires of each tightly in place with friction tape so that they cannot become loosened, then remove the gauze ties one by one while wrapping each coil tightly with fresh gauze from the roll. Coat them inside and out with white shellac.

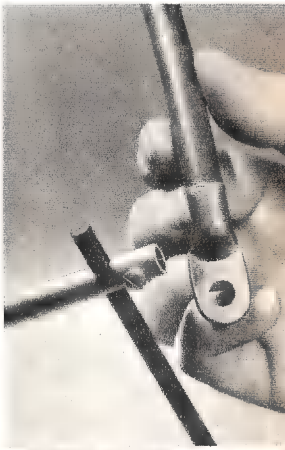
A 6-foot or longer No. 14 extension cord should be soldered to the two leads from the primary, insulating them well with friction tape. The six wires from the secondary will have to be separated into two groups of three each so that the three coils are in parallel, as shown in the drawing. To each solder a 6-foot length of No. 5 rubber-covered welding cable, one of which will later terminate at the welding electrode and the other at the ground connection.

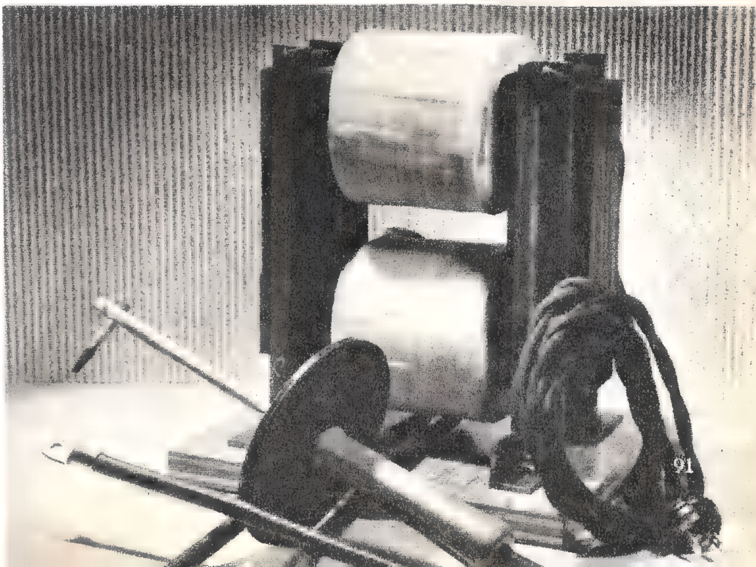
Ordinary stove iron is used for the core because it is less expensive and more generally obtainable than regular transformer steel. You will need about 150 pieces 2-x5-inch, and 150 pieces 2x6½ inches, which should make a pile 4 inches high of each size when they are tightly compressed. In order to bolt the laminated core together and support it, make four angle-iron legs 9½ inches long with a 2-inch foot turned at right angles to an end of each for bolting to an 8x10-inch plywood base 1 inch thick. Drill holes 7½ inches apart in each leg to take 2½ inches by ¼-inch machine bolts.

The drawing and the photograph shows how the pieces of stove iron are made into the transformer core. One leg with friction-taped bolts is placed on the plywood base and the laminations piled on it so that when three sides of the core are completed all that you have to do is to slip the other leg over the bolts and draw them up tightly. When laminating the core, make sure that the edges of the different pieces of iron do not overlap each other. You can then carefully tip the partially-completed core on end and wrap the two upright portions with sufficient friction tape so that the coils will fit over them tightly. The remaining half of the shorter pieces of

[*Continued on page* 141]







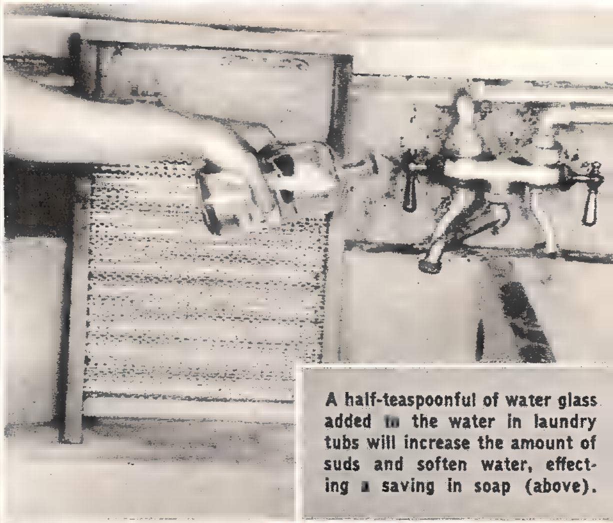
Above — The wiring diagram of the arc welder. Upper right —Details of the carbon-holding electrode, and the ground connection which is connected to the work. Right—The completed unit is mounted on a piece of heavy plywood.

USES FOR

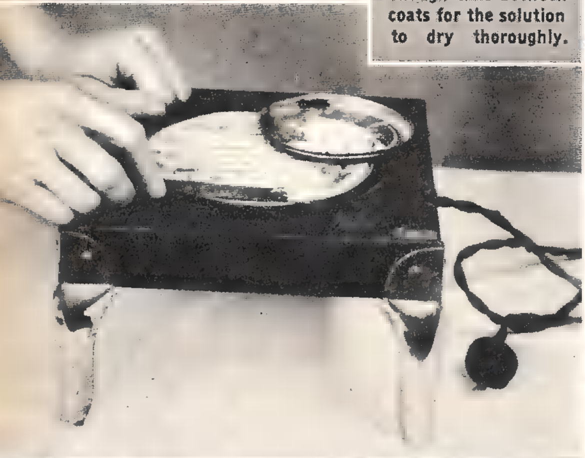
by
Raymond B. Wailes

Sodium silicate solution has many common uses, several of which are shown in these photographs.

Diluted with three parts of water and applied with a wide brush for speed (above), water glass solution can be used to waterproof cement walls. Several coats should be applied, allowing enough time between coats for the solution to dry thoroughly.



A half-teaspoonful of water glass added to the water in laundry tubs will increase the amount of suds and soften water, effecting a saving in soap (above).

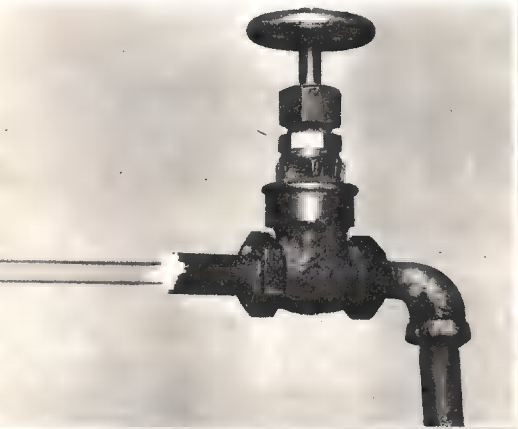


A cement made of water glass and whiting is excellent for repairing cracked ceramics (above). Water glass alone can be used to unite shattered glass objects.

Applied with a broom (above), a dilute solution of water glass and three parts of water makes an ideal treatment for cellar workshop floors, eliminating the carrying of concrete-dust footprints to other parts of the building. The solution can also be applied just as effectively with a small stiff brush.

Many grease spots that cannot be removed with ordinary cleaners can be removed by applying water glass to the spot and rubbing vigorously with a clean rag (above).

"WATER GLASS"



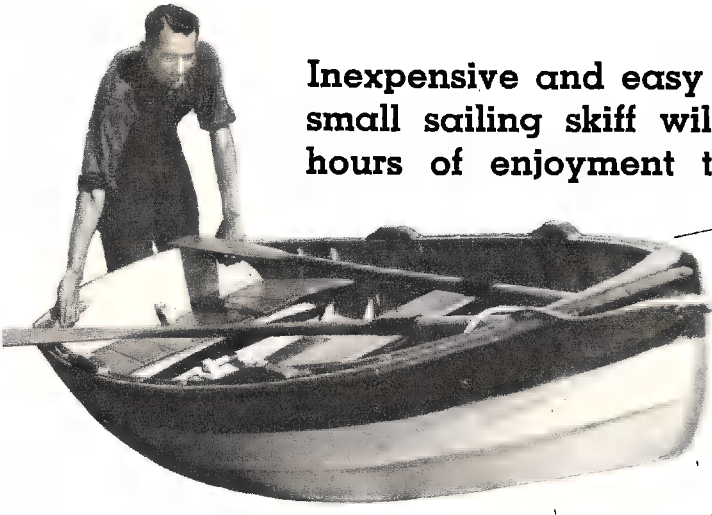
Glass tubes can be cemented in metal pipes (above) by using a cement made of water glass and whiting. If a cement more resistant to acid is desired, prepare a mixture of water glass, glycerine and litharge and apply profusely at joint where pipe meets glass.

The adhesive quality of water glass is shown in the photo above. The cardboard flap was coated with water glass and held against the building where it stuck immediately. The solution fireproofs materials somewhat. Apply it to amateur stage scenery.

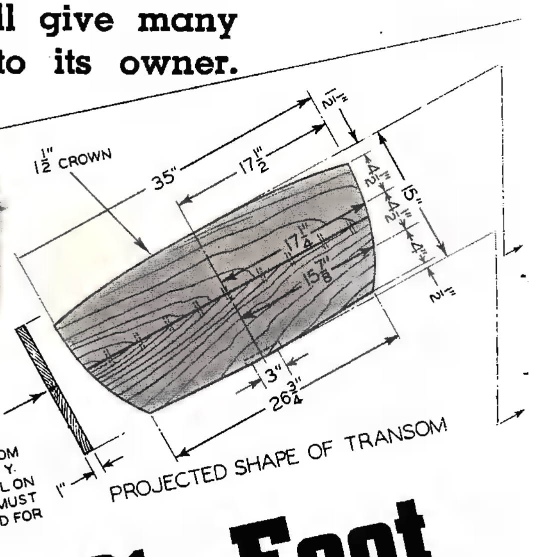
When it is desired to fasten glass to metal, make a paper gasket and place it between the glass and metal, using water glass as a cement on both sides of the gasket, as shown above. Apply the water glass on the gasket evenly with a small brush.

Applied without diluting, water glass can be used to cement rubber matting to an automobile running board.

Inexpensive and easy to build, this small sailing skiff will give many hours of enjoyment to its owner.

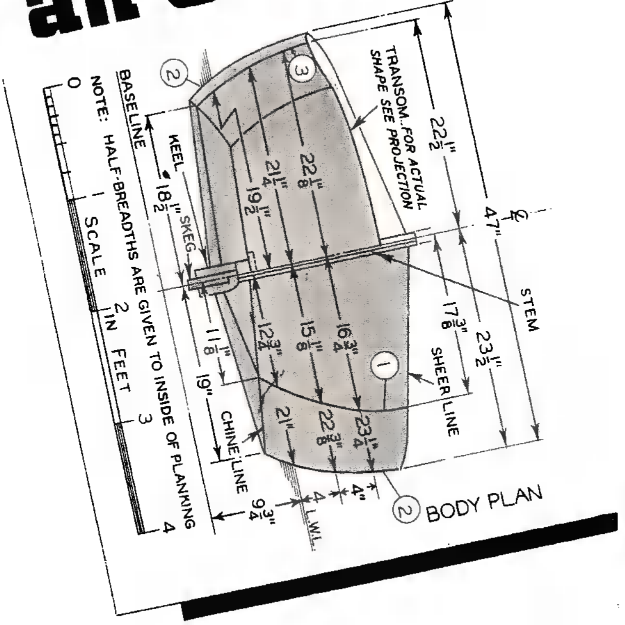


This photograph of *Patty* just before launching shows clearly her trim lines. Her light weight makes it easy to put her in or take her out of the water when the sail is over.


1½" CROWN
35"
17½"
1½"
4½"
4½"
4"
15"
17¼"
15⅞"
2"
3"
26¾"
CAULK
NOTE: TRANSOM MAY BE OF 1" Y. PINE – BEVEL ON SIDE EDGES MUST BE ALLOWED FOR
1"
PROJECTED SHAPE OF TRANSOM

Building "PATTY" – an 8½ - Foot

by J. Julius Fanta


②
③
TRANSOM..FOR ACTUAL SHAPE SEE PROJECTION
22½"
47"
℄
BASELINE
KEEL
18½"
SKEG
21¼"
19½"
22⅛"
STEM
11⅛"
12¾"
15⅛"
16¾"
17⅜"
23½"
①
SHEER LINE
19"
CHINE LINE
21"
22⅜"
23¼"
9¾"
4
4"
L.W.L.
②
BODY PLAN
0
1
2
3
4
SCALE IN FEET
NOTE: HALF-BREADTHS ARE GIVEN TO INSIDE OF PLANKING

NO END of service can be derived from this snappy skiff, *Patty*, an ideal project for the home workshop. Constructed during leisure hours, this craft with many purposes will be ready when the "sailing bug" comes around again. *Patty* is eight and one-half feet long, roomy enough for four persons without crowding and is rowed as easily as a canoe is paddled.

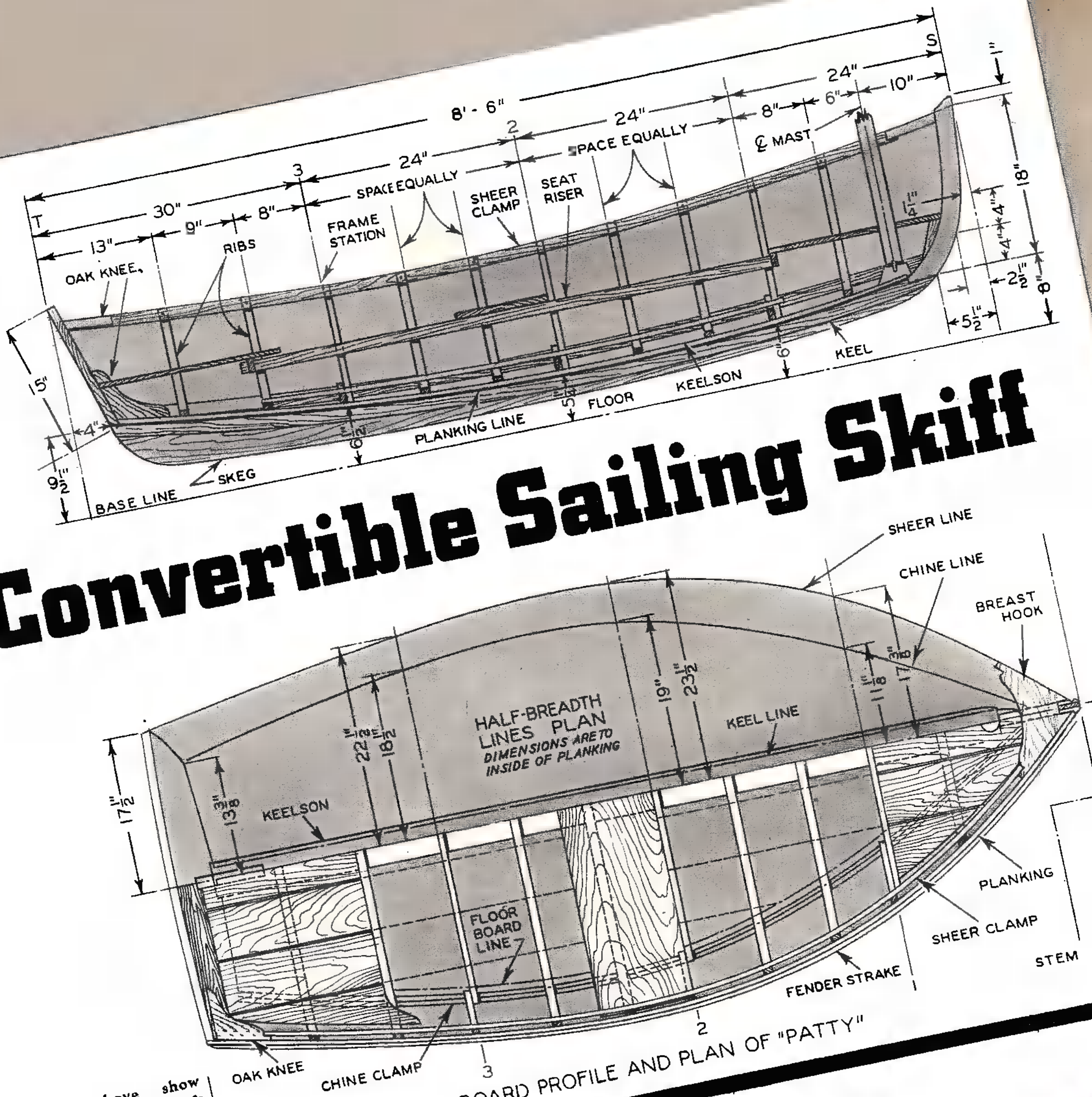
Patty makes an ideal dinghy, or tender, for a small yacht—sail or power—as she is feather-weight for hoisting and compact for stowing on deck. Propelled by a light outboard motor attached to the transom, she is a fast job. On fishing trips, this type and size is just the thing for hauling atop the car or on a two-wheel trailer. In fact, this flat-bottomed skiff with lap-strake construction is adapted to serve your every need.

Safe in rough water, *Patty* rides waves like a cork without shipping water. The lapstrake planking method makes the "skin" durable and stays leakage. Planks are fastened with clout nails. If a sailing dinghy is preferred, it is a relatively simple matter to install a centerboard, or a detachable fin.

The fact that the mold frames serve as the actual frames of this boat saves much time and effort in construction. Additional ribs to stiffen the hull are put in later.

To begin with, make the keel out of 1½"x3" white oak 7 ft., 8½" long. Cut the stem piece out of 1½" white oak to the shape shown in the accompanying sketch, and rabbet accordingly. Notch the stem and splice; water-proof the notches with marine

Convertible Sailing Skiff


S
T
8' - 6"
24"
24"
24"
30"
13"
9"
8"
8"
6"
10"
1"
2
3
SPACE EQUALLY
SPACE EQUALLY
℄ MAST
SHEER CLAMP
SEAT RISER
FRAME STATION
RIBS
OAK KNEE
18"
1½"
4"
4"
2½"
8"
5½"
15"
4"
9½"
6½"
5⅞"
6"
KEEL
KEELSON
FLOOR
PLANKING LINE
SKEG
BASE LINE
SHEER LINE
CHINE LINE
BREAST HOOK
HALF-BREADTH LINES PLAN
DIMENSIONS ARE TO INSIDE OF PLANKING
22⅛"
18½"
19"
23½"
11⅛"
17⅜"
17½"
13⅜"
KEELSON
KEEL LINE
FLOOR BOARD LINE
PLANKING
SHEER CLAMP
STEM
FENDER STRAKE
OAK KNEE
CHINE CLAMP
TRANSOM
2
3
INBOARD PROFILE AND PLAN OF "PATTY"

Details above show simplicity of construction. A centerboard or detachable fin makes it possible to use *Patty* as sailing dinghy.

If *Patty* is to be taken from the water often, round the end of the skeg to prevent it from catching on the edge of the dock.

glue and bolt the joint with ⅜″x3″ carriage bolts. To the top of the keel fasten a ½″x4″ oak keelson with 1¼″ No. 8 flat-head galvanized or brass screws.

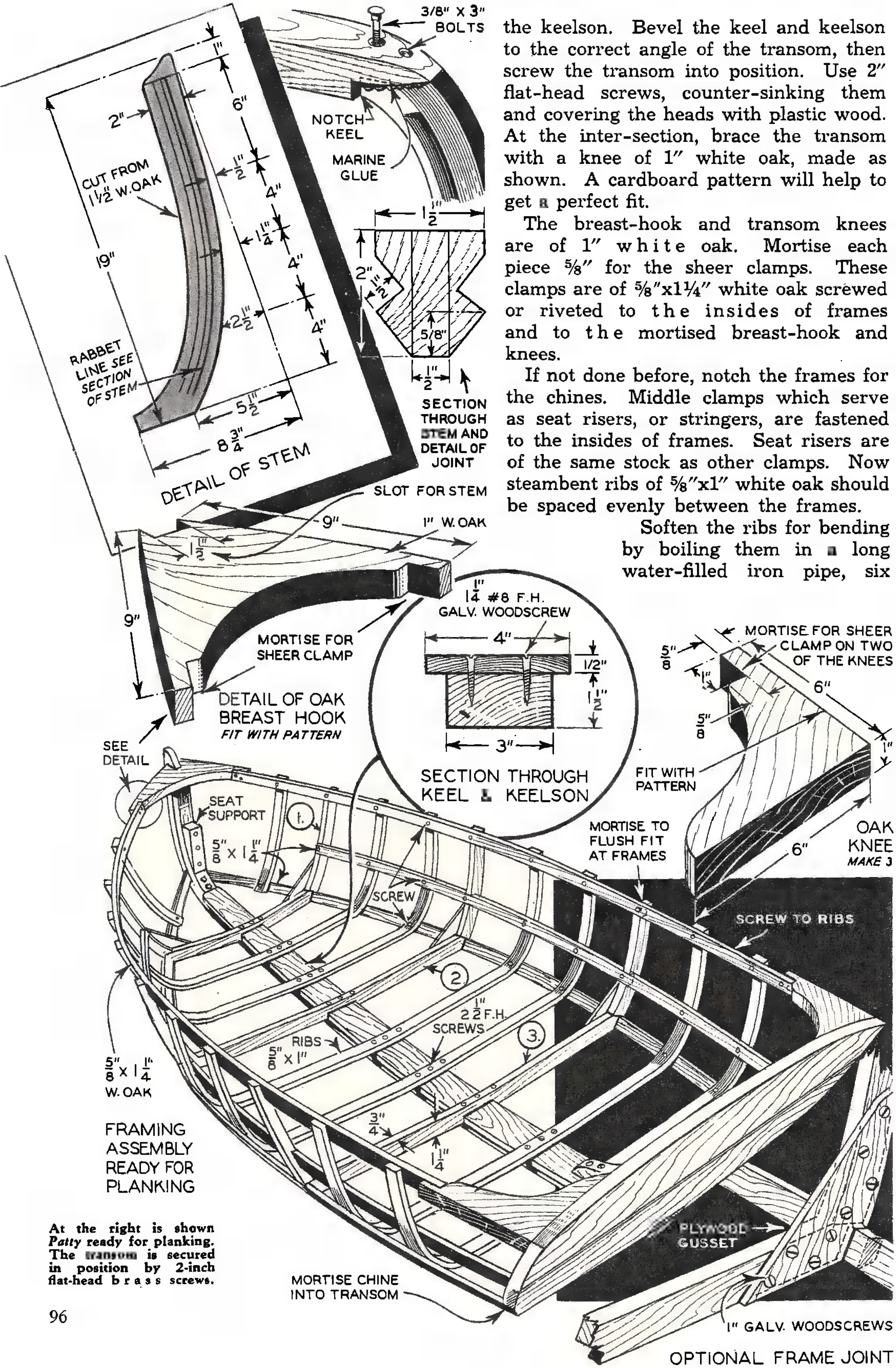
For best results make a full-sized paper pattern of the stem as well as of the three frames, transom and knees. Reproduce the half-breadth drawings to full size on paper. Frames are of ¾″x1¼″ white oak. Fasten frames joints with 1¼″ screws, leaving the corners clear for notching out for chines. The ⅝″x1¼″ white oak chines should fit flush. Brace the tops of the frames with temporary cross-pieces until the hull is planked.

Square and line up the frames at their given stations, holding them with C-clamps until fastened with 2¼″ flat-head screws to the keelson. Bevel the keel and keelson to the correct angle of the transom, then screw the transom into position. Use 2″ flat-head screws, counter-sinking them and covering the heads with plastic wood. At the inter-section, brace the transom with a knee of 1″ white oak, made as shown. A cardboard pattern will help to get a perfect fit.

The breast-hook and transom knees are of 1″ white oak. Mortise each piece ⅝″ for the sheer clamps. These clamps are of ⅝″x1¼″ white oak screwed or riveted to the insides of frames and to the mortised breast-hook and knees.

If not done before, notch the frames for the chines. Middle clamps which serve as seat risers, or stringers, are fastened to the insides of frames. Seat risers are of the same stock as other clamps. Now steambent ribs of ⅝″x1″ white oak should be spaced evenly between the frames.

Soften the ribs for bending by boiling them in a long water-filled iron pipe, six


3/8″ X 3″ BOLTS
NOTCH KEEL
MARINE GLUE
1″
6″
2″
CUT FROM 1½″ W. OAK
½″
4″
1¼″
4″
19″
2½″
4″
RABBET LINE SEE SECTION OF STEM
5½″
8¾″
DETAIL OF STEM
1½″
2″
½″
5/8″
½″
SECTION THROUGH STEM AND DETAIL OF JOINT
SLOT FOR STEM
9″
1″ W. OAK
1½″
9″
MORTISE FOR SHEER CLAMP
DETAIL OF OAK BREAST HOOK
FIT WITH PATTERN
1¼″ #8 F.H. GALV. WOODSCREW
4″
1/2″
1½″
3″
SECTION THROUGH KEEL & KEELSON
MORTISE FOR SHEER CLAMP ON TWO OF THE KNEES
5/8″
1″
5/8″
6″
1″
FIT WITH PATTERN
MORTISE TO FLUSH FIT AT FRAMES
6″
OAK KNEE
MAKE 3
SEE DETAIL
SEAT SUPPORT
5/8″ x 1¼″
1.
SCREW
SCREW TO RIBS
2.
2½″ F.H. SCREWS
3.
RIBS 5/8″ x 1″
5/8″ x 1¼″ W. OAK
3/4″
1¼″
PLYWOOD GUSSET
MORTISE CHINE INTO TRANSOM
1″ GALV. WOODSCREWS
OPTIONAL FRAME JOINT
FRAMING ASSEMBLY READY FOR PLANKING

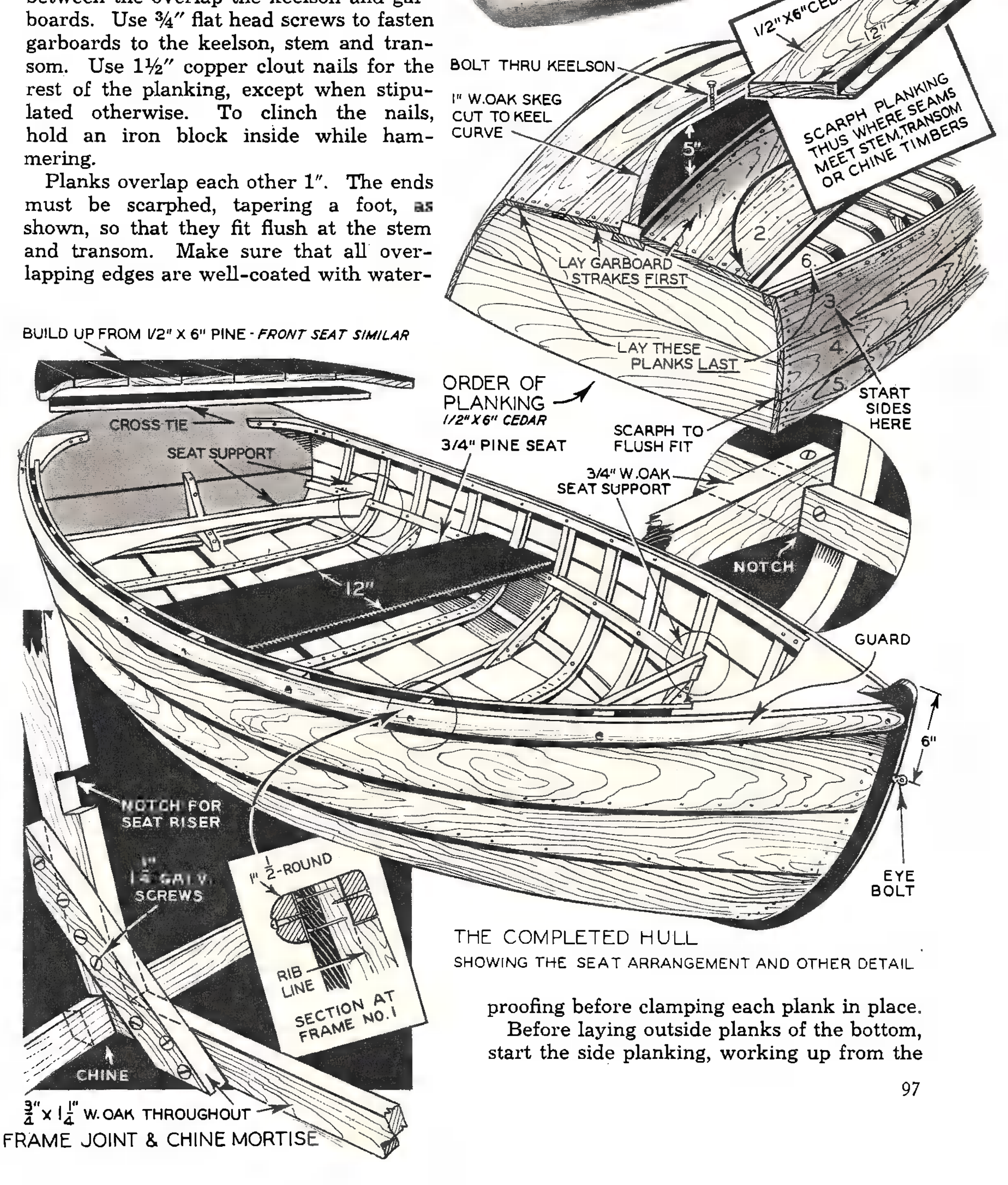
At the right is shown *Patty* ready for planking. The transom is secured in position by 2-inch flat-head brass screws.

inches in diameter, capped at one end. Prop the open end with bricks and build a hot fire under it. Handling the ribs with hot-pads, fasten them with screws to the top of the keelson and to the *outsides* of clamps. Use C-clamps to hold the ribs, eight of which are sufficient.

Now for the planking. Use ½″x6½″ cedar for this. First lay the garboards, or the planks next to the keel, coating the edges with white lead or marine glue. It is well to lay a strip of caulking cotton between the overlap the keelson and garboards. Use ¾″ flat head screws to fasten garboards to the keelson, stem and transom. Use 1½″ copper clout nails for the rest of the planking, except when stipulated otherwise. To clinch the nails, hold an iron block inside while hammering.

Here is *Patty* still in the workshop but almost completed. Screws are used to fasten the planks to the stem and transom.

Planks overlap each other 1″. The ends must be scarphed, tapering a foot, as shown, so that they fit flush at the stem and transom. Make sure that all overlapping edges are well-coated with waterproofing before clamping each plank in place.

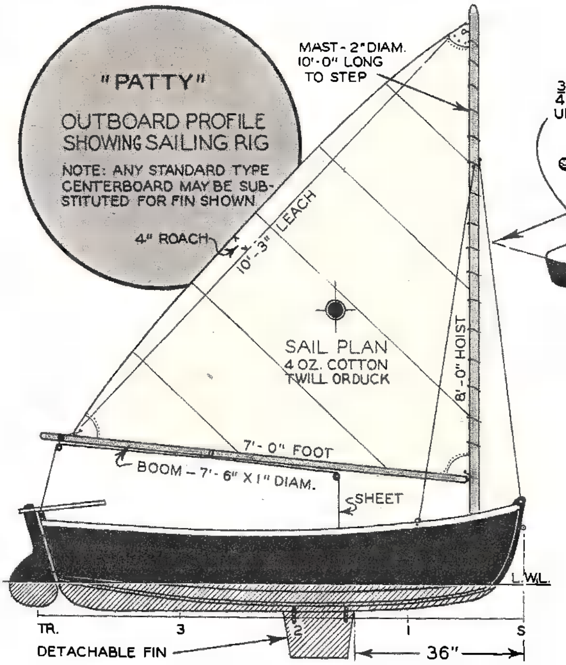

1/2"X6"CEDAR
12"
BOLT THRU KEELSON
1" W.OAK SKEG CUT TO KEEL CURVE
5"
SCARPH PLANKING THUS WHERE SEAMS MEET STEM,TRANSOM OR CHINE TIMBERS
1
2
6
3
4
5
LAY GARBOARD STRAKES FIRST
LAY THESE PLANKS LAST
START SIDES HERE
SCARPH TO FLUSH FIT
BUILD UP FROM 1/2" X 6" PINE - FRONT SEAT SIMILAR
CROSS TIE
SEAT SUPPORT
3/4" PINE SEAT
3/4" W.OAK SEAT SUPPORT
NOTCH
12"
GUARD
6"
EYE BOLT
NOTCH FOR SEAT RISER
1" 1 1/4 GALV. SCREWS
1" 1/2-ROUND
RIB LINE
SECTION AT FRAME NO.1
CHINE
3/4" x 1 1/4" W.OAK THROUGHOUT

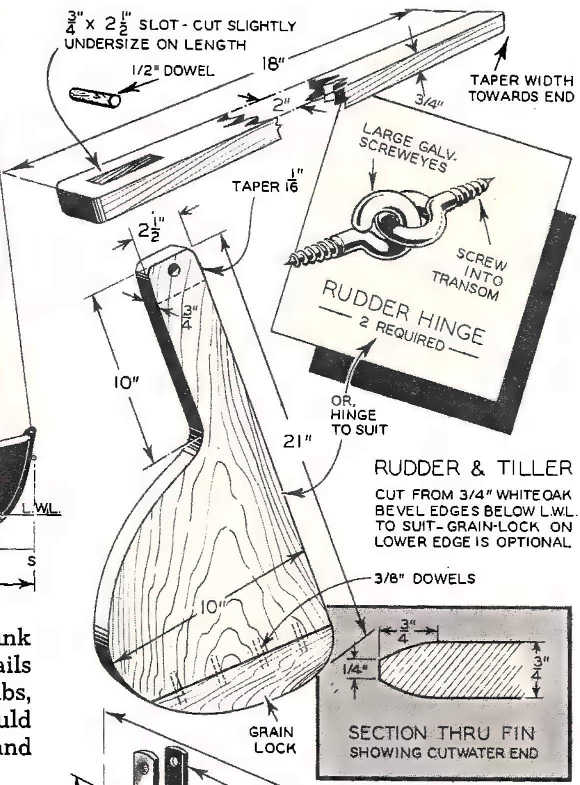
ORDER OF PLANKING
1/2"X6" CEDAR

THE COMPLETED HULL
SHOWING THE SEAT ARRANGEMENT AND OTHER DETAIL

FRAME JOINT & CHINE MORTISE

Before laying outside planks of the bottom, start the side planking, working up from the


"PATTY"
OUTBOARD PROFILE SHOWING SAILING RIG
NOTE: ANY STANDARD TYPE CENTERBOARD MAY BE SUBSTITUTED FOR FIN SHOWN
MAST - 2" DIAM. 10'-0" LONG TO STEP
4" ROACH
10'-3" LEACH
SAIL PLAN
4 OZ. COTTON TWILL OR DUCK
8'-0" HOIST
7'-0" FOOT
BOOM - 7'-6" X 1" DIAM.
SHEET
L.W.L.
TR.
3
2
1
S
DETACHABLE FIN
36"


3/4" x 2 1/2" SLOT - CUT SLIGHTLY UNDERSIZE ON LENGTH
1/2" DOWEL
18"
2"
3/4"
TAPER WIDTH TOWARDS END
TAPER 1/16
LARGE GALV. SCREWEYES
SCREW INTO TRANSOM
RUDDER HINGE
2 REQUIRED
OR, HINGE TO SUIT
2 1/2"
3/4"
10"
21"
10"
3/8" DOWELS
GRAIN LOCK
3/4"
1/4"
3/4"
SECTION THRU FIN
SHOWING CUTWATER END

RUDDER & TILLER

CUT FROM 3/4" WHITE OAK BEVEL EDGES BELOW L.W.L. TO SUIT - GRAIN-LOCK ON LOWER EDGE IS OPTIONAL

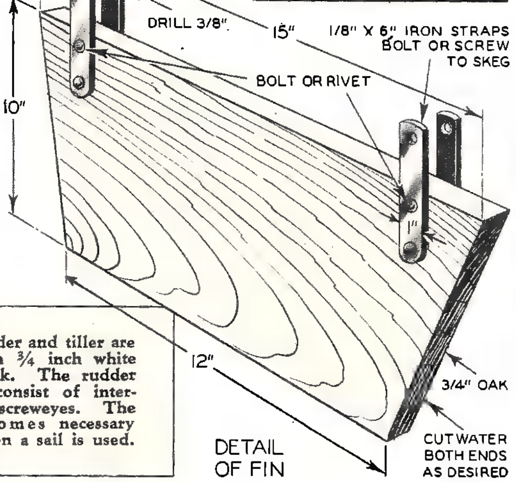
chine. The bottom edge of the first side plank should be flush with the chine. Clout nails should be used only for securing to the ribs, frames and chines, while the ends should be fastened with screws to the stem and transom.

With the side planking on, finish the bottom. Trim the over-hanging edges after fastening the inside edges of the last bottom planks with nails and the outside edges to the side planks with screws. Saw off the excess with a key-hole saw and plane flush. Screw a 1" half-round, white oak, along the gunwhales to provide a fender strake.

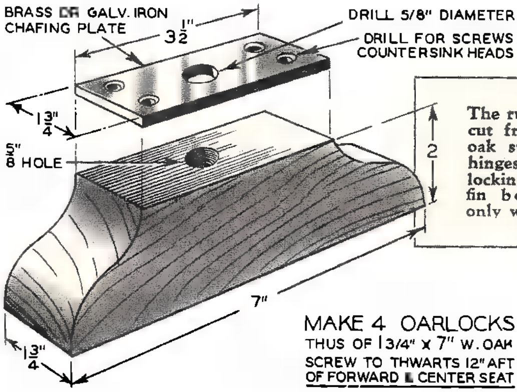
Keep the hull inverted to put on the 1"x5" white oak skeg which runs the full-length of the bottom. Drill ½" holes through the skeg and keel, and use carriage bolts of necessary lengths to hold it. Bolt-heads should be countersunk and covered with putty.

Seat supports of ¾"x1½" stock are notched at the ends to fit the seat risers, to which they are screwed. Boards for the forward and stern seats are ½"x6" pine, running fore

[*Continued on page* 138]


DRILL 3/8".
15"
1/8" X 6" IRON STRAPS BOLT OR SCREW TO SKEG
BOLT OR RIVET
10"
1"
12"
3/4" OAK
CUTWATER BOTH ENDS AS DESIRED

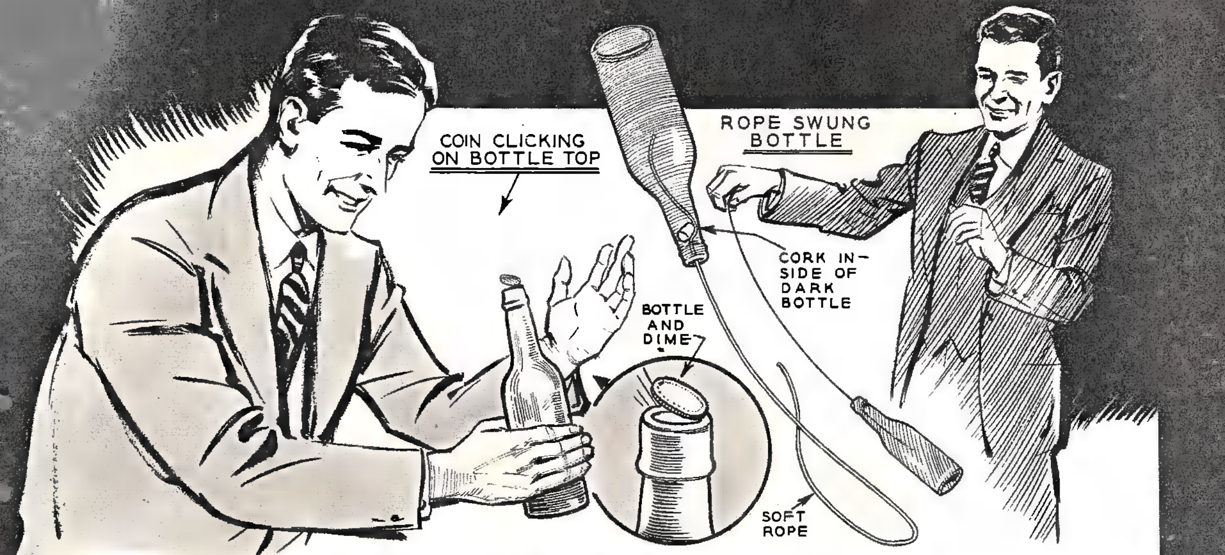
DETAIL OF FIN


BRASS OR GALV. IRON CHAFING PLATE
3 1/2"
DRILL 5/8" DIAMETER
DRILL FOR SCREWS COUNTERSINK HEADS
1 3/4"
5/8" HOLE
2
7"
1 3/4"

MAKE 4 OARLOCKS

THUS OF 13/4" x 7" W. OAK SCREW TO THWARTS 12" AFT OF FORWARD ℄ CENTER SEAT

The rudder and tiller are cut from ¾ inch white oak stock. The rudder hinges consist of interlocking screweyes. The fin becomes necessary only when a sail is used.


COIN CLICKING ON BOTTLE TOP
ROPE SWUNG BOTTLE
CORK INSIDE OF DARK BOTTLE
BOTTLE AND DIME
SOFT ROPE

TRICKS WITH BOTTLES

by Martin Gardner

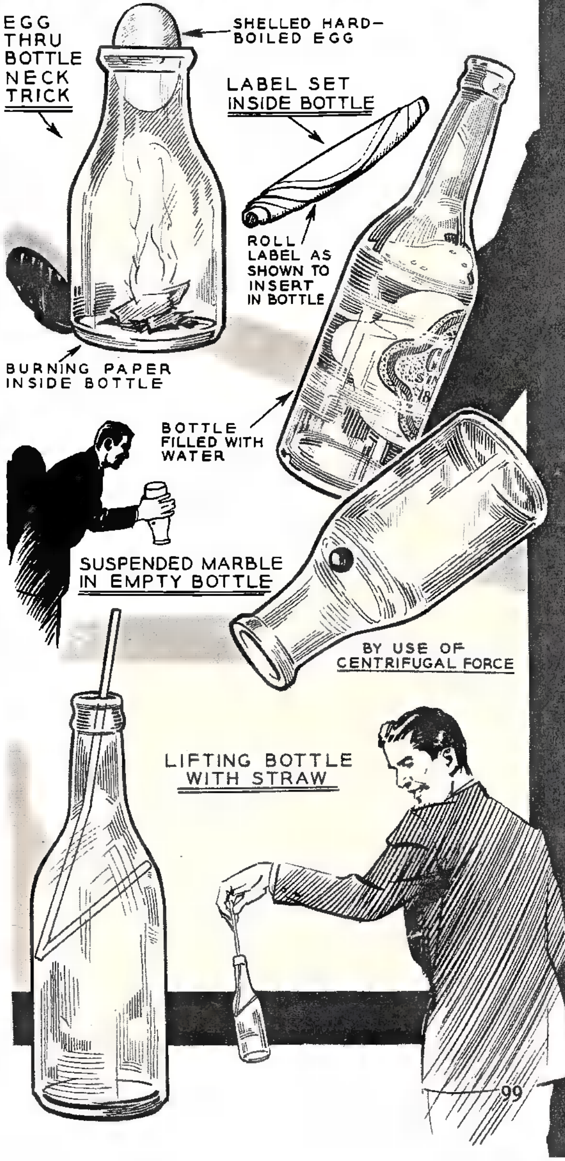
A GREAT many interesting and entertaining tricks can be performed with ordinary bottles, and some of the tricks afford excellent illustrations of various laws of physics.

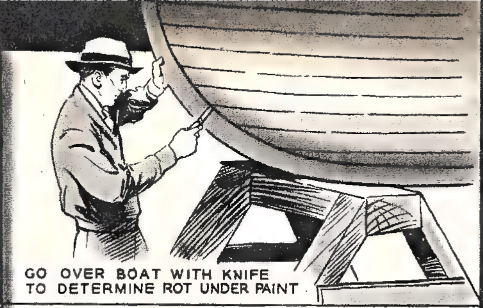
For example—the next time you purchase a cold bottled drink, pour the liquid into a glass and try this experiment with the empty bottle. Place a dime over the opening and moisten it around the edges to make the bottle air tight. Do this by dipping your finger in some water and allowing a few drops to fall from the finger tip to the edges of the coin. In a few moments the dime, apparently of its own accord, will begin to click up and down at regular intervals! This is because the cold air inside the bottle is beginning to warm. When air is heated it expands, so the expanding air forces its way out past the edge of the coin. You can speed the motion of the dime by placing your hands around the bottle. The heat from your hands warms the air inside more rapidly. The same experiment can be performed at home by placing an empty bottle in the ice box for a short time before you begin.

MILK BOTTLE-EGG TRICK

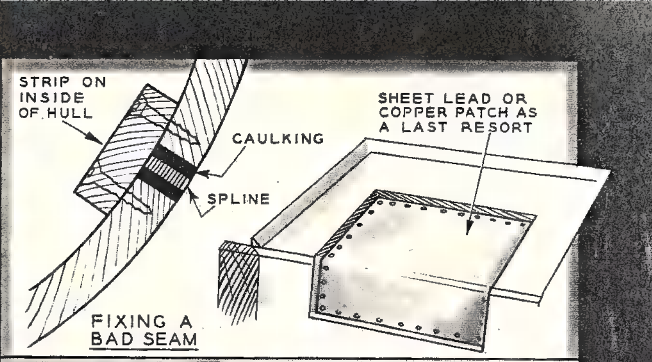
A somewhat similar type of trick makes use of an empty milk bottle and a hard boiled egg from which the shell has been removed. Place the egg on the opening of the bottle and challenge anyone to make the egg pass through the neck to the inside. It is

[*Continued on page* 134]

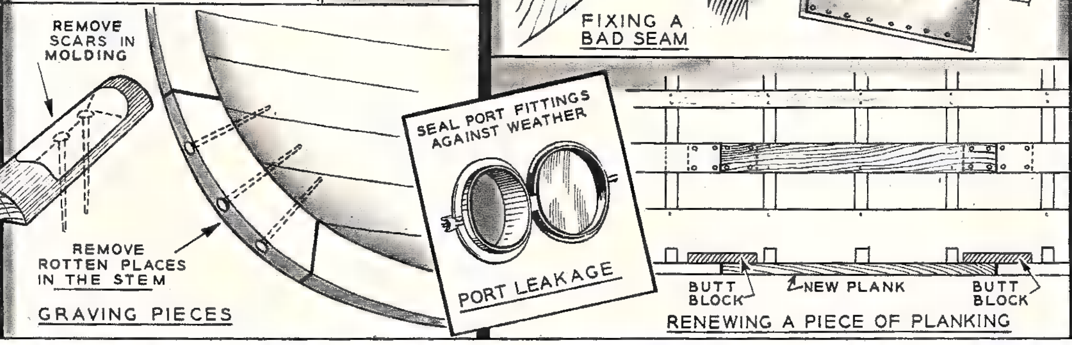

EGG THRU BOTTLE NECK TRICK
SHELLED HARD-BOILED EGG
BURNING PAPER INSIDE BOTTLE
LABEL SET INSIDE BOTTLE
ROLL LABEL AS SHOWN TO INSERT IN BOTTLE
BOTTLE FILLED WITH WATER
SUSPENDED MARBLE IN EMPTY BOTTLE
BY USE OF CENTRIFUGAL FORCE
LIFTING BOTTLE WITH STRAW



GO OVER BOAT WITH KNIFE TO DETERMINE ROT UNDER PAINT



FIXING A BAD SEAM


REMOVE SCARS IN MOLDING
REMOVE ROTTEN PLACES IN THE STEM
SEAL PORT FITTINGS AGAINST WEATHER
BUTT BLOCK
NEW PLANK
BUTT BLOCK

GRAVING PIECES

PORT LEAKAGE

RENEWING A PIECE OF PLANKING

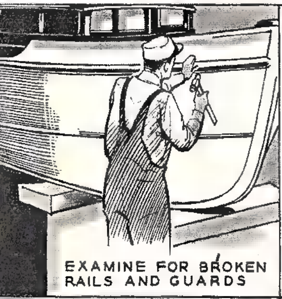
THE SPRING OVERHAUL

by Sam Rabl

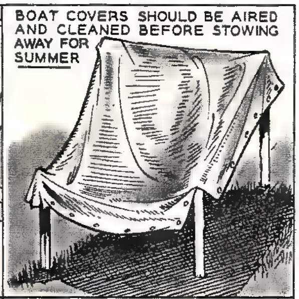
WITH the advent of the first housefly, or the song of the first robin, those of us who own a boat begin to get itchy fingers and soon saunter down to the boat yard "just to look her over." A casual inspection will reveal enough to get started on but with the beginning of every season the inspection of any boat should not be "casual." There is a set system of examination that those who have owned a boat for a number of years have found to be the best and that in the long run will cut the time involved in the overhaul to a minimum.

The first looking-over should be for the discovery of any defects. The old timer will get out his pocket knife and start poking into the wood to discover any "soft spots" hidden under the paint. Paint has a bad habit of hiding the effects of rot, and the seasoned boat owner knows just where to expect to find this menace if it is present. He will start poking the planking at the rabbet in the stem and follow its line from the top to the point where it joins the keel. Should the knife enter very easily at any point, he will start digging away the paint to discover the reason. Let us assume for example that a bad spot does exist. The rotten wood must be removed and graving pieces or "dutchmen" securely fitted so that the strength of the little ship is not impaired. If many rotten areas are found, the entire member should be replaced.

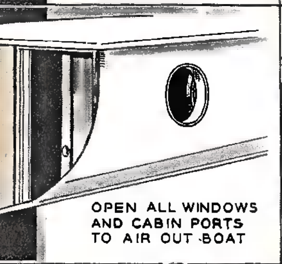
Around the transom and along the keel are other likely places to look for rot. Examination should be made also for damaged timbers due



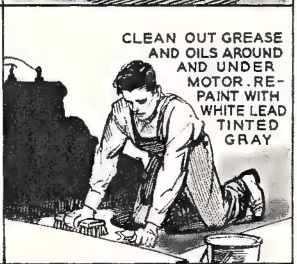
EXAMINE FOR BROKEN RAILS AND GUARDS



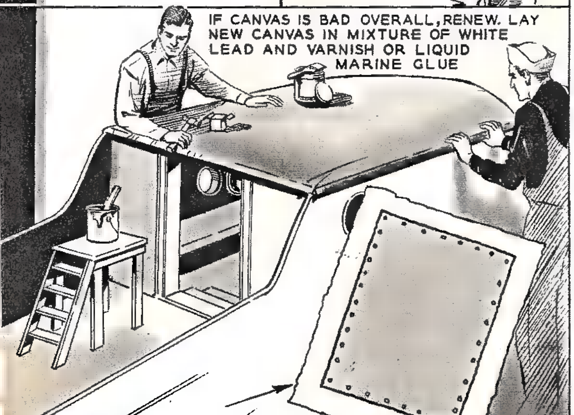
BOAT COVERS SHOULD BE AIRED AND CLEANED BEFORE STOWING AWAY FOR SUMMER



OPEN ALL WINDOWS AND CABIN PORTS TO AIR OUT BOAT

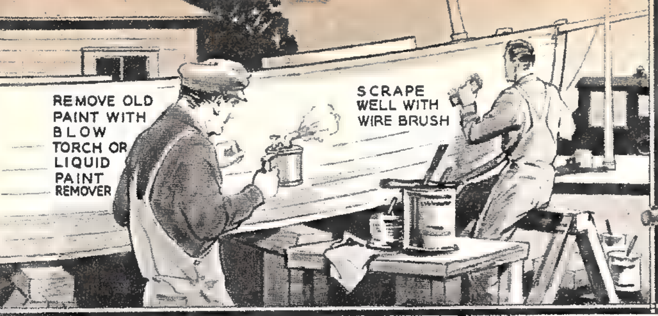


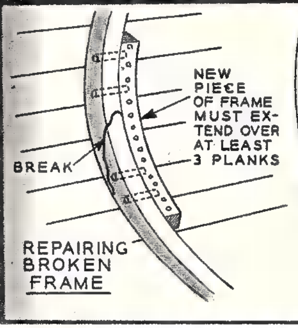
CLEAN OUT GREASE AND OILS AROUND AND UNDER MOTOR. REPAINT WITH WHITE LEAD TINTED GRAY



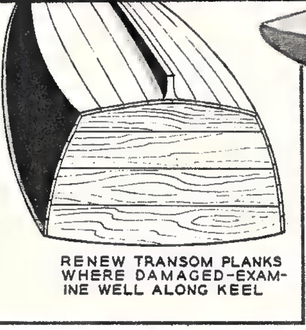
IF CANVAS IS BAD OVERALL, RENEW. LAY NEW CANVAS IN MIXTURE OF WHITE LEAD AND VARNISH OR LIQUID MARINE GLUE

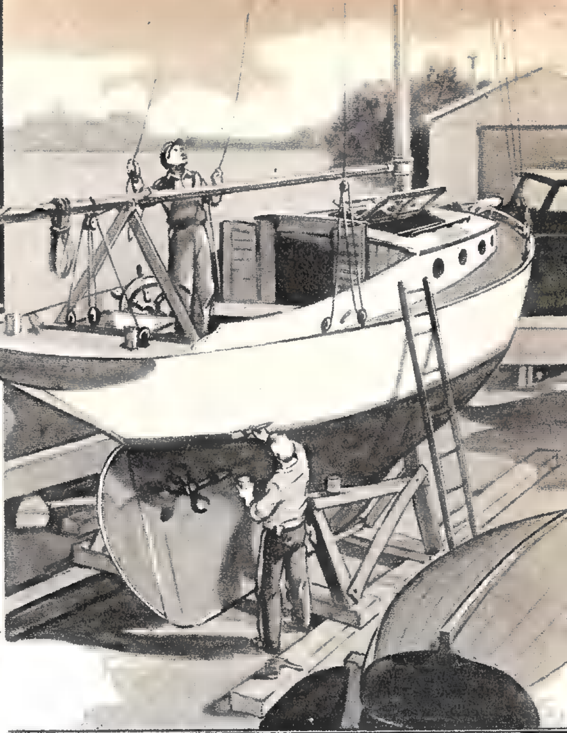
BAD SPOT CAN BE PATCHED IN NEAT SQUARES LAID IN PAINT OR GLUE. TACK THE EDGES.


REMOVE OLD PAINT WITH BLOW TORCH OR LIQUID PAINT REMOVER
SCRAPE WELL WITH WIRE BRUSH



REPAIRING BROKEN FRAME


RENEW TRANSOM PLANKS WHERE DAMAGED—EXAMINE WELL ALONG KEEL



ON THE BOAT

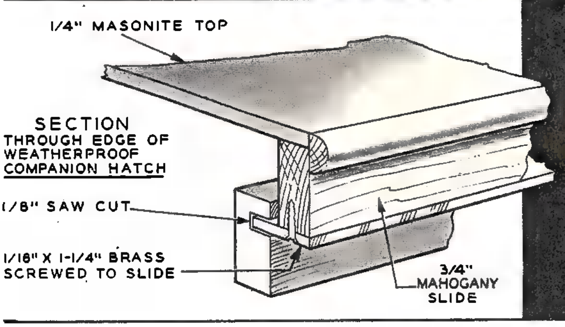
possibly to that hard knock the boat got against the dock last year. Where a plank is badly scarred it would be well to renew the affected length. Any renewed plank should extend over three frames at least, and should be cut at the center of the space between the frames so that butt blocks may be fitted. Never splice in a new plank depending on the frames alone to cover the joint. This is sometimes done in some cheaply constructed boats.

Where frames have been broken, a length of new frame should be bent in alongside of the damaged ones so that it will cover at least three planks each side of the break. It should be securely fastened to both the broken frame and to the planking.

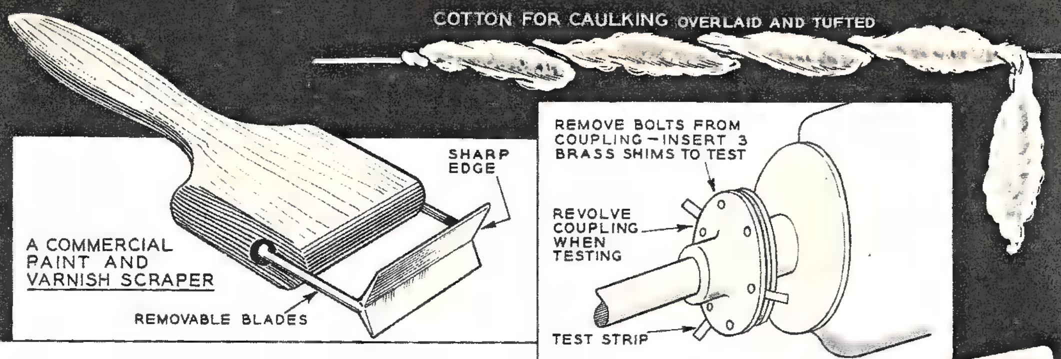
Worn and scarred places on the rails and guards should be renewed by fitting an entire new piece, or by graving pieces. After all of the bad places in the hull have been repaired, another thorough going over should be given the hull. In the meantime, if she had a winter cover, this should be given a thorough airing and drying before it is stowed away for the next lay-up. All of the windows or cabin ports should be propped open to air the inside of the boat. The interior around the bilge should be given a thorough scrubbing and cleaning and all old oil and grease removed from the interior below the motor. Grease and oil, besides appearing messy, create a fire hazard.

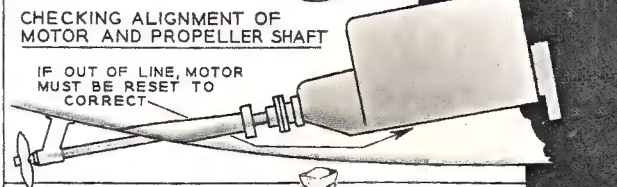
After the bilges have been cleaned they may be painted with a good white lead paint, tinted gray. They may also be given a coat of pine tar oil or creosote, both of which are somewhat smelly; or they may be given a coat of whitewash which will give the boat a sweet and clean odor and which will in a great measure protect it from dry rot. A strong solution of salt water in all the dark places will also be a good preservative from rot. The decks and cabin top should now be gone over and any bad places repaired. If the canvas is worn and cracked in many places the best thing to do is to renew it. All the moldings should be removed and the old canvas torn off. The new canvas is laid in a mixture of white lead and varnish or in liquid marine glue, made especially for this purpose. A good trick after laying canvas is to prime it with a thin coat of casein glue, which when set can be sanded to a very smooth surface.

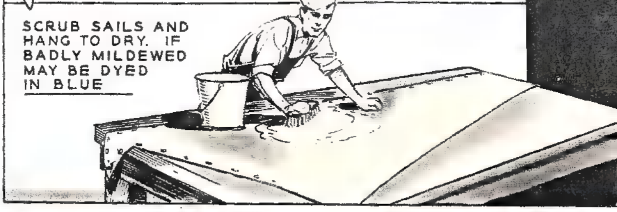
If the canvas is bad only in spots these can be repaired with neat squares of new canvas laid in paint or glue and their edges neatly tacked. Another good trick is to apply hard

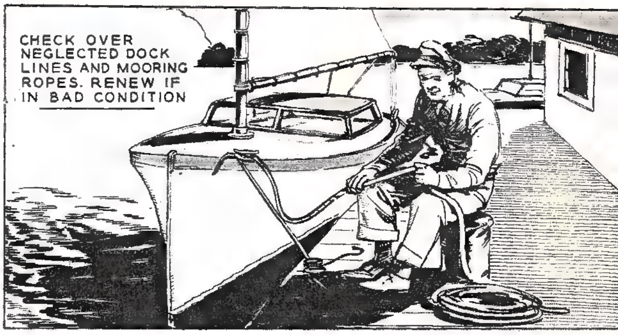


SECTION THROUGH EDGE OF WEATHERPROOF COMPANION HATCH


COTTON FOR CAULKING OVERLAID AND TUFTED
SHARP EDGE
A COMMERCIAL PAINT AND VARNISH SCRAPER
REMOVABLE BLADES
REMOVE BOLTS FROM COUPLING—INSERT 3 BRASS SHIMS TO TEST
REVOLVE COUPLING WHEN TESTING
TEST STRIP


CHECKING ALIGNMENT OF MOTOR AND PROPELLER SHAFT
IF OUT OF LINE, MOTOR MUST BE RESET TO CORRECT


SCRUB SAILS AND HANG TO DRY. IF BADLY MILDEWED MAY BE DYED IN BLUE

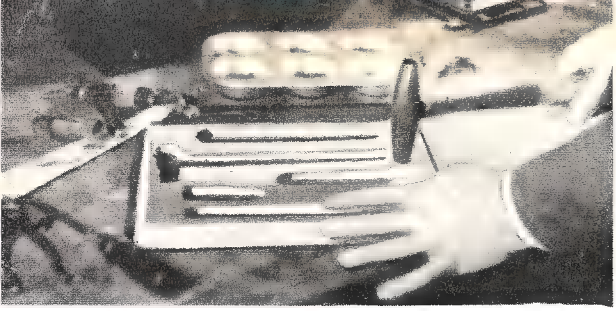

CHECK OVER NEGLECTED DOCK LINES AND MOORING ROPES. RENEW IF IN BAD CONDITION

marine glue (which is sold for canoe repairs) around the edges and iron this down to a thin edge. Leaks around the skylights or ports should be repaired with seam putty or stick marine glue. Another way to stop a deck leak is to apply some of the new elastic cement made for this purpose. This new type of cement, when applied, runs like water but finally hardens into a rubbery substance which is truly eternally elastic, resisting the twisting of the hull without ever breaking loose and leaking again.

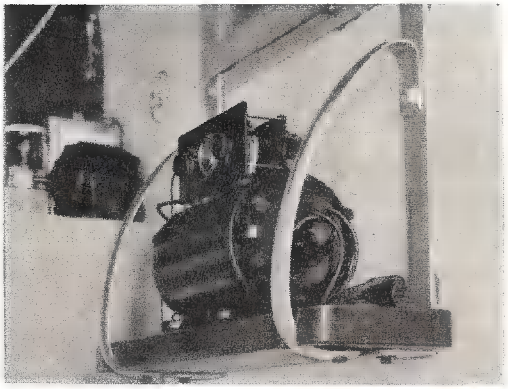
With the hull in tip-top condition, and if time is available, give some thought to improvements before starting to paint. For instance, it might be well to renew her old painted moldings with new ones of mahogany or oak to give her a more snappy appearance. Nothing sets a boat off more than a little varnished wood or "bright-work," as a yachtsman would call it. We might want to make a more weatherproof companion slide or to fit a hatch forward in the cabin that may be hinged to give better ventilation and give access to the bow without going over the cabin top, which is a hazardous undertaking in rough weather. Time and the condition of your pocketbook will decide just how much of the work will come under the heading of improvements.

Now for the painting. The one best rule in any kind of paint work is: "Start from the top and work down." First of all, no paint work should be started, other than priming coats, until all the dirty work on the hull and motor is complete. Then start with the removal of any of the cracked and blistered paint. There are any number of good paint removers of the paste or liquid type on the market, but most of the old timers around the waterfront still prefer to remove their paint with a blow torch and a putty knife. This of course will introduce a fire hazard to the novice. With all the old paint removed, the bright work should be gone over, removing the old varnish with a liquid remover, and finishing up with a cabinet scraper or a piece of broken glass. There are some very handy little scrapers on the market which are easily sharpened and do a much better job than any piece of glass will do. The bare wood of the bright work should then be given a coat of linseed oil, and if a darker color is desired the oil should have a little oil stain mixed in with it. After the oiling, it is sanded down smooth and the first coat of varnish applied. Cheap varnish is worse than useless. To preserve the finish, buy the best varnish that you can afford. The new bakelite resin types are excellent for boat work. All bright work should be given at least four coats, which should be thoroughly sanded with fine sandpaper after each coat. No varnishing should be done on a damp day or when dust is flying.

[*Continued on page* 145]

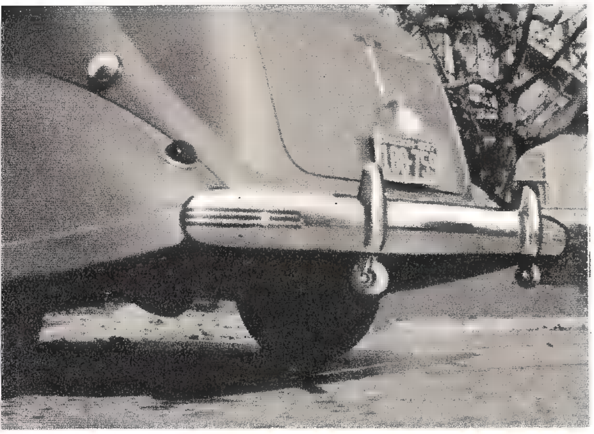


Bumpers Become Brackets

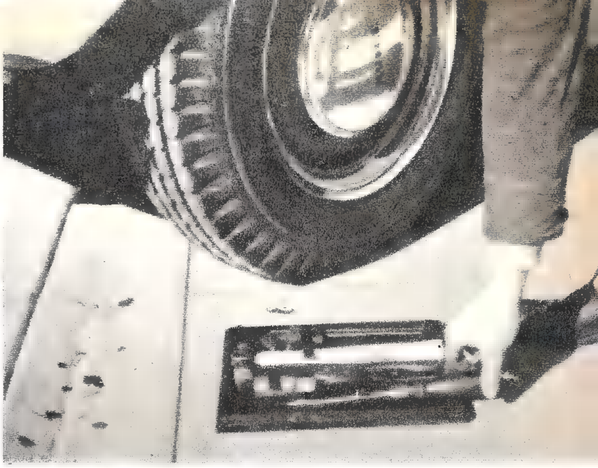


OLD automobile bumpers can be used to make neat and modern appearing shelf brackets. For the shelf shown above, $\frac{5}{16}$ by 2-inch iron is used for the rear members, to which are fastened the curved bumpers.—R. L. Kunau.

Wheels Protect Rear Of Car



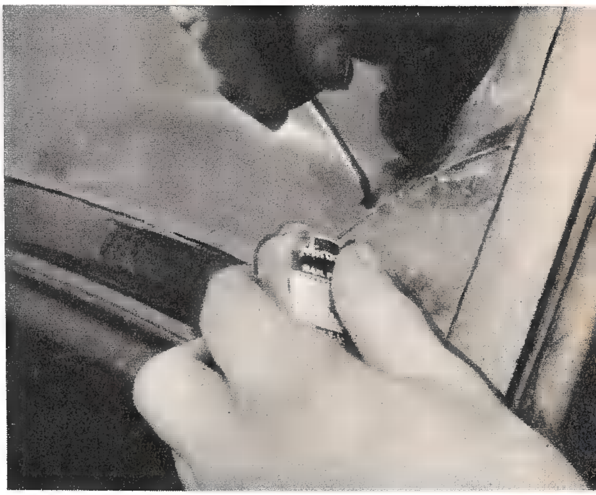
WHEN present day low slung cars go up or down steep driveways, the edge of the bumper often strikes the ground. If two small rubber tired casters are fastened to the bottom of the bumper as shown in the above photograph, this problem will be eliminated.—Fred Parks.



Flat Pack Holds Auto Tools

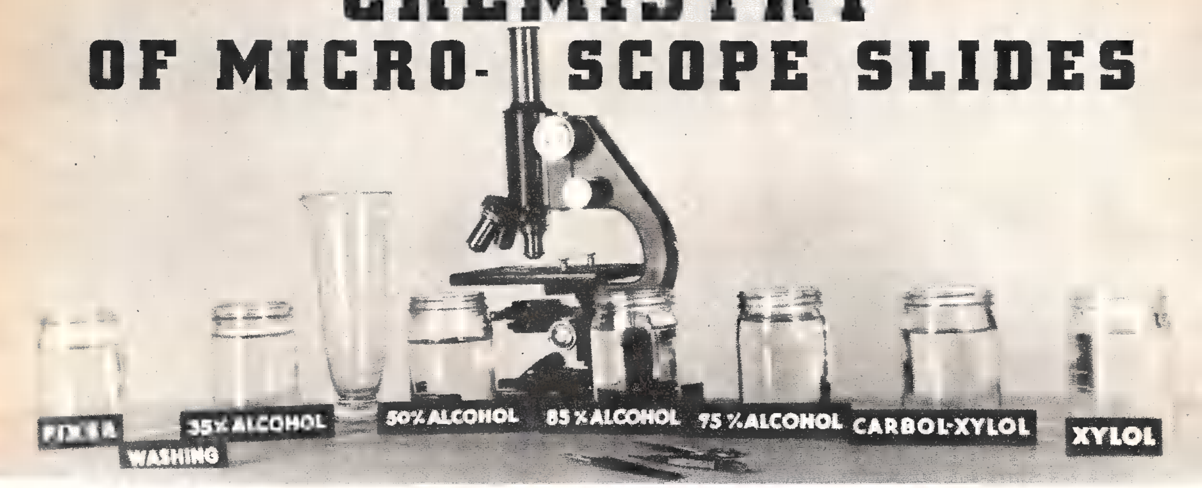
HOW to keep the auto tools handy, clean and quiet usually is a problem to the average motorist. However, the flat tool kit shown above becomes an easy solution. Two pieces of three-eighths-inch plywood, nine by twelve inches, are required. The tools to be contained in it are placed on one of the boards and an outline of each is drawn. The outline then is cut on a jig saw. The other board is fastened to the cut out piece with small nails. The tools are held in place by small wire clips.—Arnold S. Lutes.

Nail Polish Aids Windshield

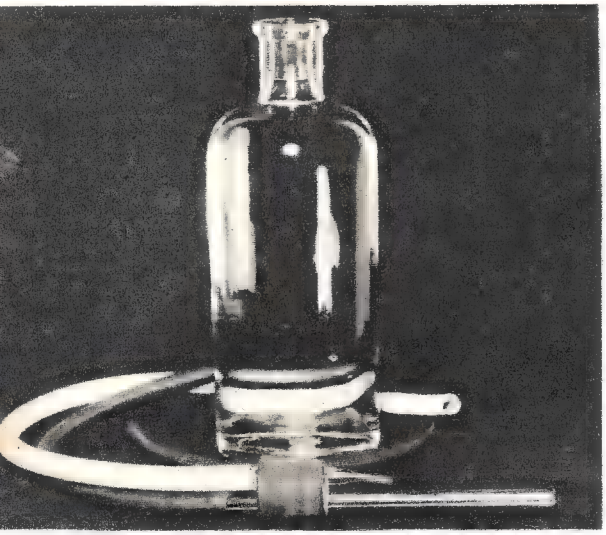


WHEN safety glass windshields are cracked, the air enters between the two pieces and the pane often clouds over or becomes opaque. If a small quantity of ordinary nail polish is flowed into the crack when this first happens, no air or moisture will enter and the windshield will not change in appearance.—W. C. Wilhite.

CHEMISTRY OF MICROSCOPE SLIDES



Above are shown typical materials used for processing microscope specimens. The glassware is quite inexpensive.



A washing bottle is a very convenient aid for specimen preparation. Note the small spring on the end of the short tube. It prevents the specimen from clogging the outlet.

by Julian D. Corrington, Ph.D.

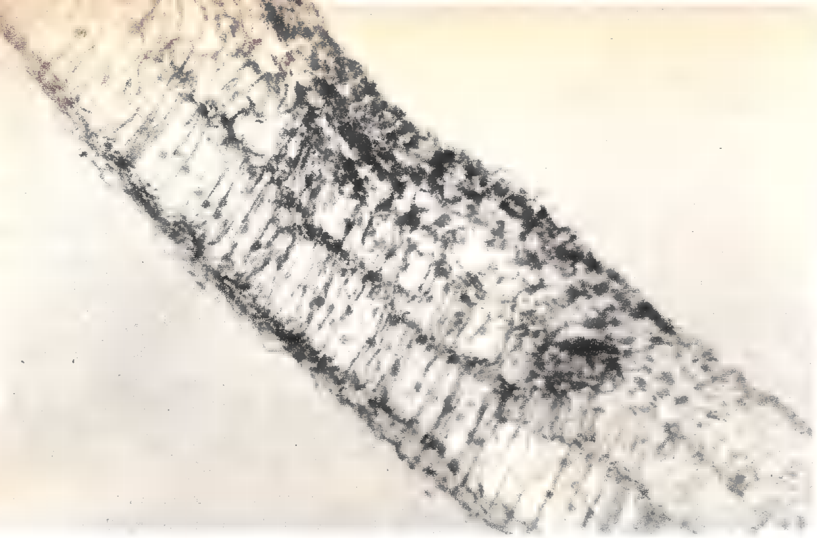
IN ORDER to get living materials into the form of permanently mounted microscope slides, many steps must be used—some chemical, others mechanical. Collectively, these processes constitute the science of microtechnique, and they fall into five principal groups—fixing, sectioning, staining, clearing and mounting. Last month we detailed the methods and steps in sectioning; this chapter gives information on fixing, and the whole will be completed next month when the remaining three steps will be considered.

Fixing is a general term to include a number of stages that are actually separate, but are customarily lumped together as a single operation because they are done with a single chemical and as one job. The first accomplishment in fixing is that of killing, which in microscopy refers to the living substance within cells and tissues rather than to the animal or plant as a whole. It must be done quickly, to prevent post-mortem changes.

Secondly, fixing performs a poisoning that will prevent attacks by bacteria or fungi which would otherwise cause decay; it impregnates the tissue with metals and preserves them permanently. Lastly, the material is hardened so that it cuts better, and prepared to take certain dyes.

One of the best single reagents for fixing is 10% formalin, made by adding ten volumes of water to one of commercial formalin. A better one for most purposes, however, is formol-acetic alcohol, the formula for which is: 5 cc. full strength commercial formalin, 5 cc. glacial acetic acid and 90 cc. of 50% alcohol. This can be made up at any drug store, but if one is to do any serious work in miscroscopy he must learn to prepare his own reagents, so we will go into the matter briefly of how such solutions are concocted.

In all technical work the unit of weight is the gram, abbreviated g., and of fluid measurement the cubic centimeter, cc., also termed milliliter, ml. These are equivalent, one gram of water measuring one cc. Formulas are figured on a basis of 100% equal 100 cc., hence percentages indicate the number of cc. or g. If larger amounts are desired, multiply all



An improperly fixed specimen of a lilac leaf. This appears mushy and some details are eliminated entirely. However, when directions for this important step in microscope technique are followed, slides of striking clarity and detail are obtained.

Here is an example of a properly fixed specimen. It shows an infinite amount of detail under microscope.

volumes by two, three or any other desired amount of increase.

Solids must be weighed, involving the use of a precision type of scales known as a chemical balance. A very fine and expensive instrument is not needed in general microscopy, but only one that will weigh out as small a quantity as a single gram.

For measuring fluids the apparatus is simpler: one or more graduated cylinders. If only one is purchased, get the 100 cc. capacity; if two—and it is better to have a large and a small—secure one of 25 and one of 250 cc. The cost averages around sixty-five cents each. Balances, cylinders, beakers, watch glasses, chemicals and many other materials needed in this work may be purchased from any of a great many scientific supply houses, and from local dealers in the larger cities.

We are now prepared to measure out everything in the foregoing formula except the alcohol. The making up of various percentages of this important reagent has to be done constantly and so to this step we now direct our attention.

Full strength commercial alcohol is 95% in purity; that is 95% alcohol and 5% water and it is this mixture that must be diluted in making up lower percentages. In our present example we need 50% alcohol. How does one obtain a 50% mixture from one of 95%? Sounds like a problem in arithmetic, but the procedure is really simple. Since 50 is the strength wanted and 95 the percentage to be diluted, subtract 50 from 95 to find the proportion of water to be added. Hence 45 parts water plus 50 parts 95% alcohol will yield 95 volumes of 50% alcohol.

In actual usage this is automatically accomplished by filling a graduated cylinder with 95% alcohol up to the same number as the required percentage (50 in this case) and then with water to the 95 cc. mark. To make 70% alcohol, pour in full strength alcohol up to the 70 cc. level, then add water to bring the whole to the 95 cc. mark. Water used in making up fixtures may be tap water, whereas that taken for compounding staining solutions should be distilled.

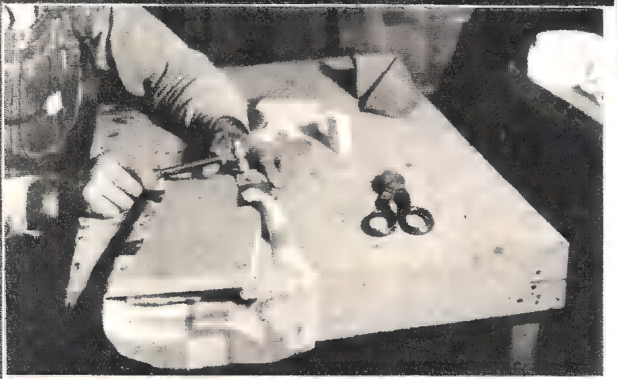
Different writers on microtechnique employ a series of alcohols varying according to individual preferences, but we recommend that you make up 95 cc. each of 35, 50, 70 and 85 percentages. Pure grain (ethyl) alcohol is preferable but difficult to obtain. Wood (methyl) alcohol serves nearly as well but is extremely poisonous and must be handled with care; hence it is not recommended for inexperienced workers. Denatured alcohol, the kind most readily procurable, is ethyl alcohol to which small amounts of some poisonous substance, such as pyridine or methyl alcohol, have been added to make the mixture unfit for internal consumption. There are many denaturing formulas, some better than others for microscopy. Try to get formula No. 1 if possible.

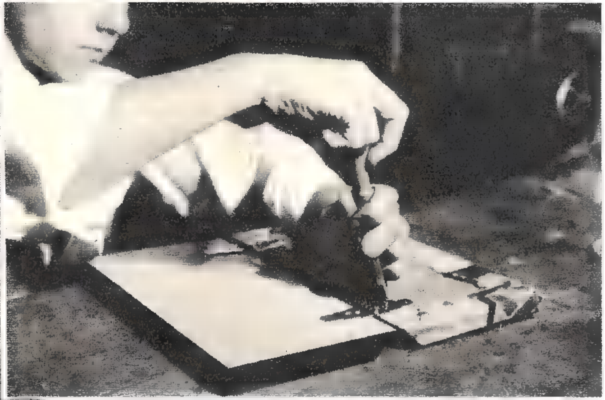
Thus far, we have made up our formol-acetic alcohol fixer; now how to use it? We need some suitable glassware, and our title illustration gives an idea of the variety available. A small, straight-sided glass called a tall Stender dish is one of the best, obtainable from a supply house. Most five and ten cent stores carry a similar small glass; those in which cheeses for sandwich spreads are now sold are perfect for this purpose, and any

[*Continued on page* 143]

A DOWEL STEP-UP

by Dale R. Van Horn



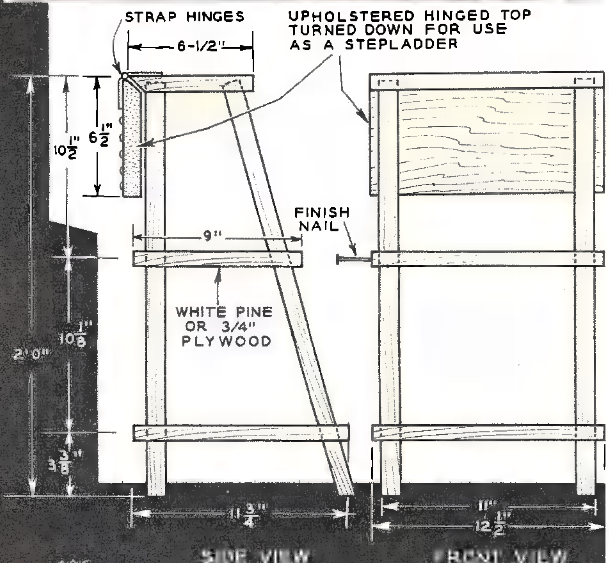


FOUR boards and four dowels form this smart kitchen adjunct. Anyone with no other tools than a saw, square, brace and bit and screwdriver can make it.

Four 1-inch maple dowels, 23½ inches long, are required. You will also need four white pine boards, each 12½ inches long and of the following widths: two 6½ inches wide, one 9 inches wide, and one 11¾ inches wide. Bevel the two adjoining edges of the two top pieces, allowing for the hinge pins and the upholstery cloth thickness. Pad the hinged piece with batting, and over this lay a piece of heavy cloth 6½ inches wide by 12½ inches long. Over all this lay the piece to be used for the covering. Fold all four edges over and tack to the under side. Hinge the two pieces together after the 1-inch holes have been bored in the under side of the top ½-inch deep. Bore 1-inch holes through the corners of the other two steps—those at the back corners being put through vertically while those in the front corners are bored at an angle easily determined by laying the step-up on its side on the bench and tracing angle lines on the edges of the steps.

The tops of the dowels are glued in place, but all other step-and-dowel unions are joined by driving 8-penny finish or casing nails through the edges of the step, through the dowel itself and into the inner portion of the step. Because maple is quite hard, holes slightly smaller than the nails to be used should first be bored through the dowels at the correct places.

For a finish, the edges of the steps can be painted Chinese red and the rest painted ivory. The dowels are also given the red trim coat.


STRAP HINGES
UPHOLSTERED HINGED TOP TURNED DOWN FOR USE AS A STEPLADDER
6-1/2"
10 1/2"
6 1/2"
9"
FINISH NAIL
WHITE PINE OR 3/4" PLYWOOD
10 1/8"
2' 0"
3 3/8"
11 3/4"
11"
12 1/2"

SIDE VIEW

FRONT VIEW

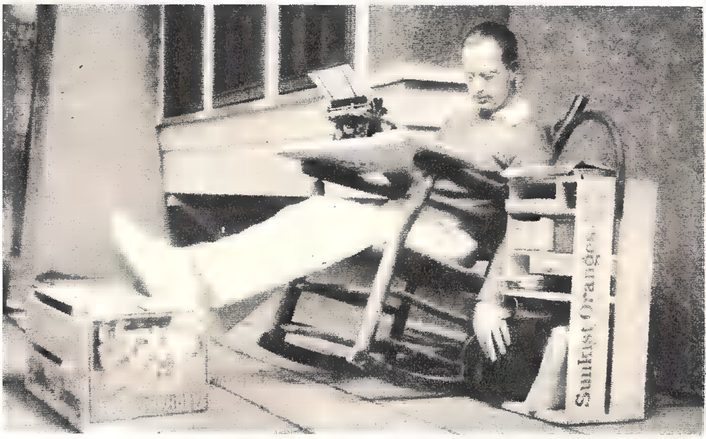
ORANGE CRATE PORCH OFFICE

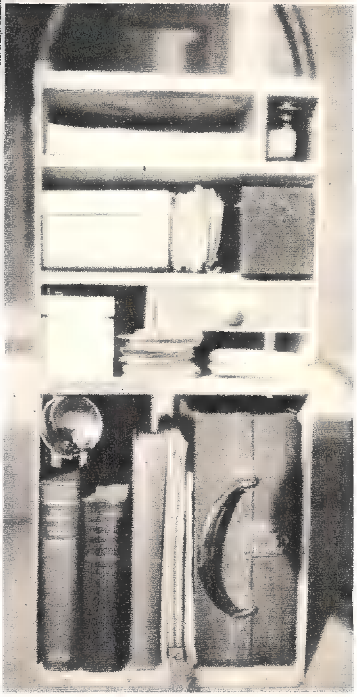
by
Bertram
Brownold

A PORTABLE desk constructed of materials usually found in the average home will be useful for the man of the house as well as for children attending school who have home work to do.

An orange crate is partitioned to hold a portable typewriter, reference books, stationery and miscellaneous papers. A cigar box divided off inside, and with a pull knob, is a handy drawer for rubber bands, paper clips, stamps and other small odds and ends. A tin can fastened under one of the shelves will hold pencils and fountain pen. A short length of rubber hose makes a convenient handle for carrying the box where ever work is to be done.

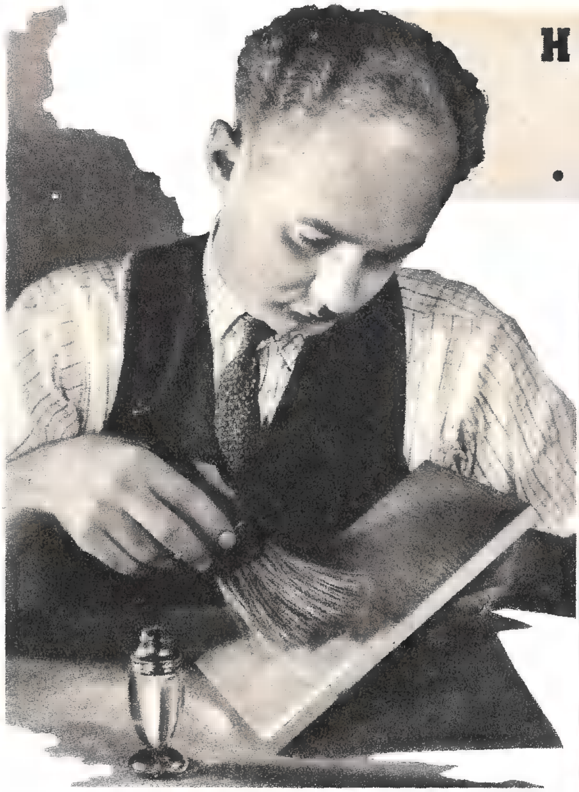
A board across the arms of a rocking chair will make an excellent desk. The board can be fitted with pegs on its under side to prevent it from slipping on the arms while in use. The same board strapped across the front of the crate becomes a cover and prevents anything in the box from falling out while being carried.

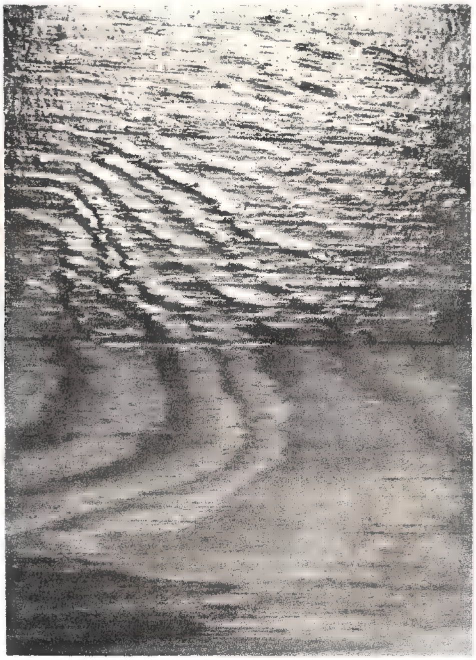




Any number of partitions or sections can be built into the box, depending on the requirements of the user. For the man who occasionally has office work to do at home, this portable desk will be very useful. Many times it is not convenient to work in some particular room in the house because of visitors or for some other reason. At this time, the "office" can be picked up and taken to some other location. During warm weather, many persons would like to work outside if it were not so much trouble to take all the necessary material outside. With everything necessary in one box, any desired location immediately can become a private office. A little sandpapering and a coat or two of paint dresses it up so that it presents a pleasing appearance.

HOW TO GET A





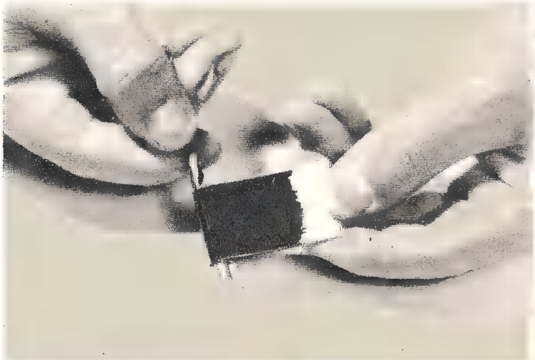
A simple means of determining if the surface is dry is to sprinkle some salt over a test piece of wood painted at the same time as the original. If the salt brushes off without marring the finish, it is dry. Above—An example of the value of sandpapering. Top strip was not smooth when finish was applied, while bottom section was thoroughly sandpapered. Below—A coat of enamel makes this table look like new.

MODERN paints give to the amateur the ability to do a paint job possible in past years only by the skilled craftsman. Manufacturers and experienced chemists have been working hand in hand to improve finishing materials so that anyone who can wield a paint brush at all can secure results that would astonish the old-time professional decorators.

Much of the experience that was formerly required in manipulating the brush is now incorporated in the paint itself. This is particularly true in the case of interior finishes such as enamels and varnishes. A great many of them are "self-leveling," which to the layman means that brush marks left by an awkward hand will automatically be leveled out of sight. Most of them will dry in four hours or so, which means that home routine need not be disrupted for days at a time as in the past.

"What make of finish shall I use?" is not such an important question if it is asked regarding any of the well-known brands. The manufacturer, proud of his product, states on the label in simple language exactly what it is intended for and how it is to be used. You can rely on that information; it has been tested time after time.

MASTER FINISH WITH UNSKILLED HANDS . . . .



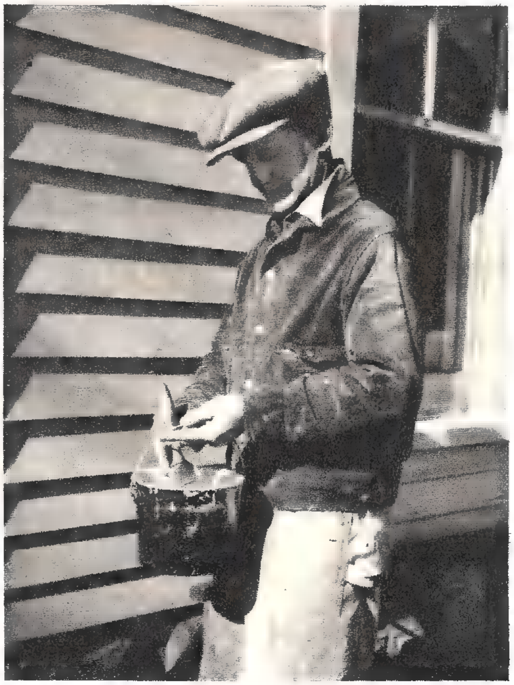
Above (left)—To test the quality of enamel or varnish, coat a small piece of tin. When it is dry, the finish should not crack, peel or check when the tin is bent around a ⅛ inch rod. Above—To make cleaning of the hands easy after the painting is done, rub some vaseline over them before starting to paint. Left—A small sprayer will give a fine finish to small articles. Use a spare tire for the compressed air supply

However, what about the cost? This good paint, good varnish or enamel, certainly appears to be expensive. A small can of it may cost a dollar or more, while down the street you can get a similar-sized can for a fourth of the money, perhaps with a brush included.

Experience is a good, but very costly teacher where paint is concerned. A cheap four-hour enamel may possibly be applied with the same amount of time required to brush on a reliable make. It may dry in four hours, or it may still be tacky a week later, according to the luck that the manufacturer had with the compounding of that particular batch. The most disappointing part, however, is its inferiority on the points most desirable in a good finish. These are (1) the ability to preserve and protect the surface to which it is applied. (2) Appearance; it should brighten the interior or exterior of a home. Thirdly, it should promote sanitation and be easy to keep clean; finally, a durable, lasting finish meeting the foregoing qualifications should increase the value of the property. These requirements are obviously not met in a cheap material that quickly becomes dull, fades, may become tacky during humid weather and is liable to peel or crack after a few weeks or months.

A good finish is one that dries hard, yet retains enough flexibility and elasticity so that it will not check when the surface to which it is applied expands and contracts due to temperature changes. To make a good comparative test, coat a small strip of tin with the paint, varnish or enamel and allow it to dry well. It should not check or show the least sign of stress when the strip is bent around a ⅛-inch rod (such as the shank of a drill bit). Some good grades of enamel,

If, when your finger is rubbed over a painted surface, some of the paint rubs off, immediate repainting is necessary.



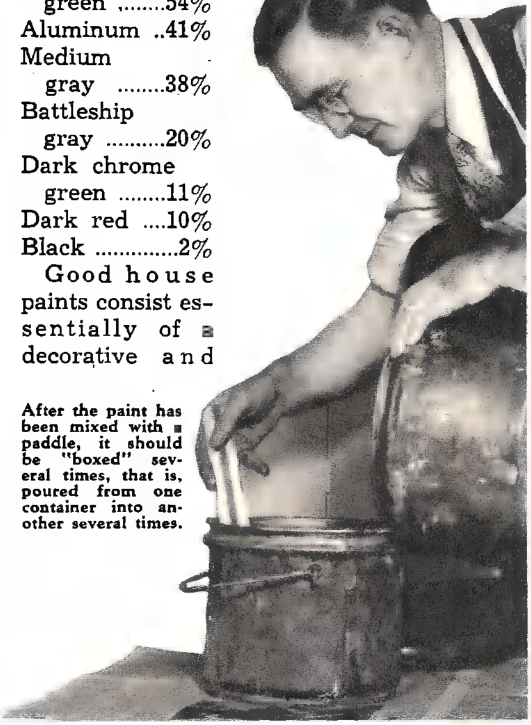
Always start painting a house on the north side. Work around so that the sun remains ahead.

when put to this test, can even be crumpled and pounded and not the least sign of a crack will appear.

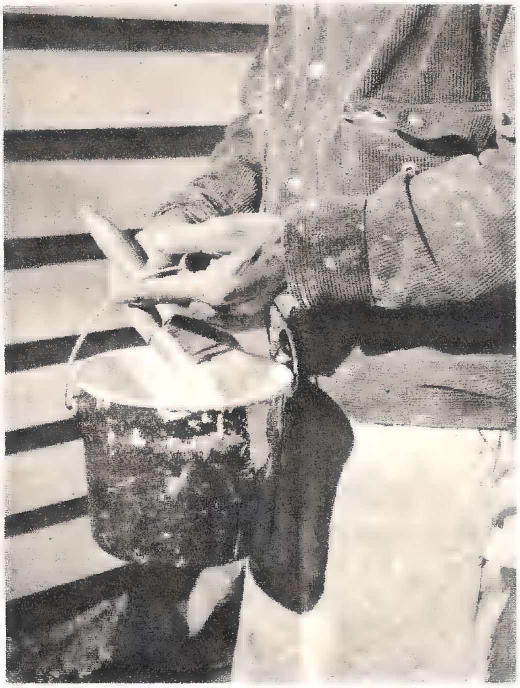
Perhaps you are wondering just what color or shade would be most suitable inside or outside your home. Much depends on whether you wish to brighten up a dark room, or to tone down the brightness. Good paint will do either. The "brightness" of a film of paint or enamel indicates the percentage of light that it will reflect. Some time ago an accurate check was made of the reflecting powers of the different colors of pigments used in good quality finishes, and it is quoted here to aid you in controlling the brightness range of a room you intend partially or entirely redecorating. The figures refer to the percentage of light reflected:

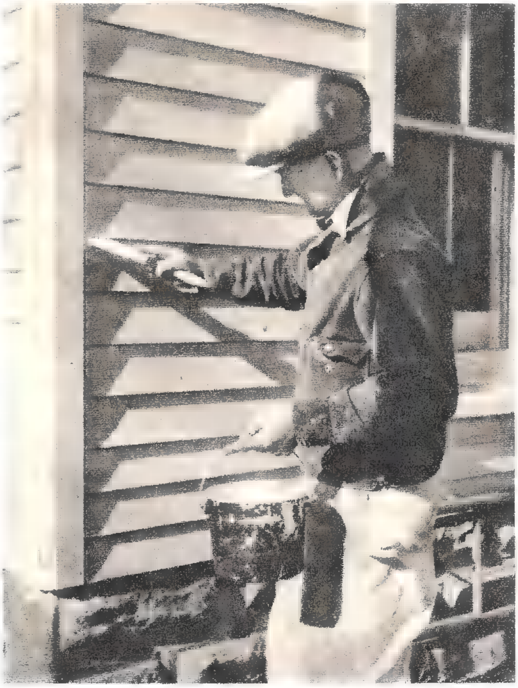
Good white paint	84%
Pearl gray	72%
Light green	70%
Pink	70%
Ivory	65%
Buff	55%
Pale sea green	54%
Aluminum	41%
Medium gray	38%
Battleship gray	20%
Dark chrome green	11%
Dark red	10%
Black	2%

Good house paints consist essentially of a decorative and



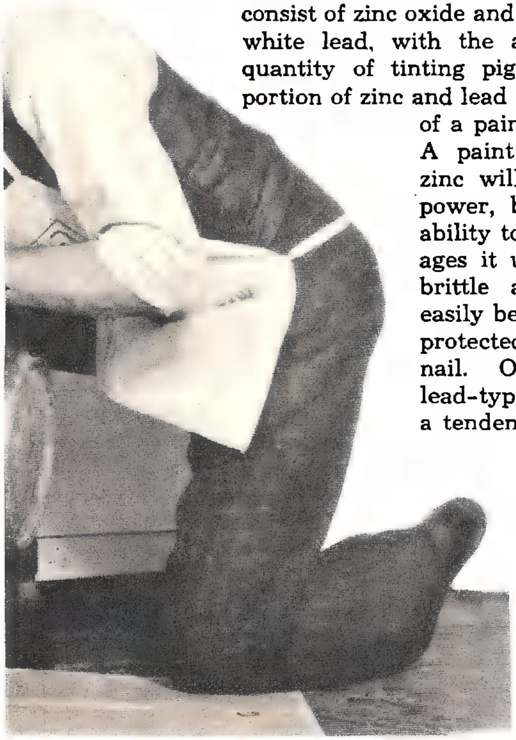
After the paint has been mixed with a paddle, it should be "boxed" several times, that is, poured from one container into another several times.





The proper method of applying paint is as follows: Dip the end of the brush into the paint; slap it lightly against the side of the pail, and give the brush a half turn before applying it to the surface. This prevents paint from dripping from the brush. Work it out with the grain, and then across the grain. Finish with light strokes with the grain.

protective pigment suspended in a drying oil, which serves as a binder, with a thinner and other ingredients added to suit the type of work to be covered. Ordinarily the pigments consist of zinc oxide and white lead, with the addition of a smaller quantity of tinting pigments. On the proportion of zinc and lead depends the suitability of a paint for a given purpose. A paint composed mostly of zinc will have great covering power, because of its greater ability to reflect light, but as it ages it unfortunately becomes brittle and cracks, and can easily be chipped from the unprotected wood with a fingernail. On the other hand, a lead-type paint does not have a tendency to peel but it does, on becoming old, dry out into a chalky powder which readily rubs off. These two counter influences are taken advantage of in good quality paints by combining the lead and zinc in scientifically correct proportions so that each counteracts the deficiency of the other.



When painting sash, it will be easy to remove dabs from the glass if the edge is first coated with whiting-and-water paint.

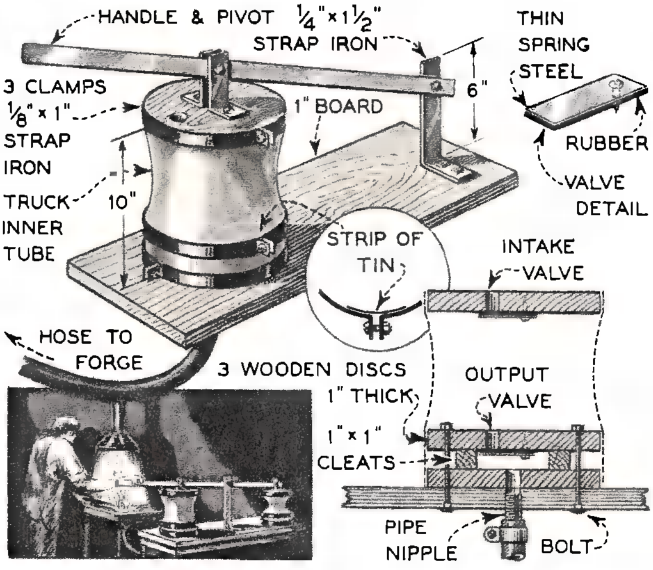
If the job is one of repainting you will save money by seeing that the old surface is absolutely clean, free of dirt and oil, and in

[*Continued on page* 145]

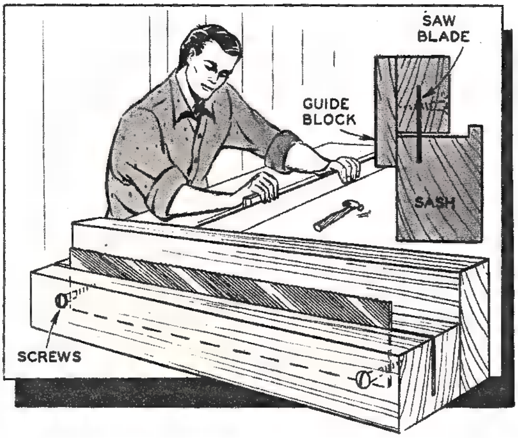
Truck Inner Tube Makes Efficient Shop Bellows

THE construction of this bellows, suitable for shop use, is simple, and the parts are those usually found in the junk box. If the air requirements are not too great, a single unit will be sufficient, but if more air is needed a double acting unit can be built. When the dual unit is to be used, the handle is extended to accommodate the second bellows at the opposite side of the pivot point. An almost continuous supply of air then is available because one bellows inhales while the other exhales.

All the wooden discs are one-inch thick and have a diameter one and one-half inches larger than the inside of the inner tube when it is unstretched. The ¾-inch pipe nipple for the air hose should be smeared with strong glue before it is screwed into a snug fitting hole.—T. L. Moore.


HANDLE & PIVOT ¼"×1½" STRAP IRON
THIN SPRING STEEL
6"
RUBBER
VALVE DETAIL
3 CLAMPS ⅛"×1" STRAP IRON
1" BOARD
TRUCK INNER TUBE
10"
STRIP OF TIN
INTAKE VALVE
HOSE TO FORGE
3 WOODEN DISCS 1" THICK
OUTPUT VALVE
1"×1" CLEATS
PIPE NIPPLE
BOLT

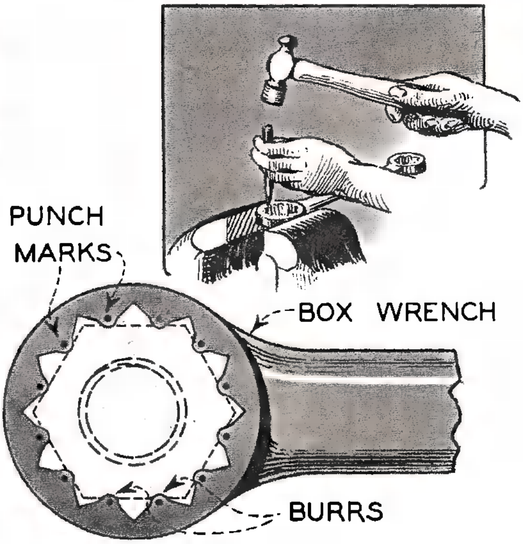
Saw Becomes Grooving Tool


SAW BLADE
GUIDE BLOCK
SASH
SCREWS

THIS handy tool will save considerable time when making grooves in window frames or screens. It consists of two hardwood blocks, approximately seven inches long, to accommodate a five-inch compass saw blade. The distance that the saw blade projects above the edge of the strip will depend on the depth of the cut desired. Also the guide block's distance from the saw blade will regulate the distance of the cut from the edge.—M. A. Hall.

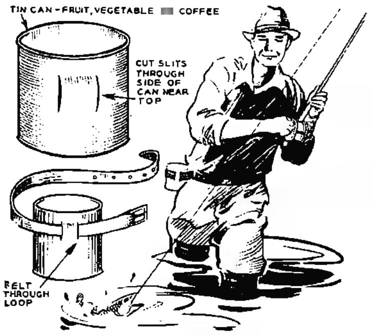
Burrs Improve Box Wrench

MANY times when a box wrench is used on a long shank bolt, the wrench falls below the nut unless held in place. This difficulty can be eliminated by crimping or burning the top edges of the jaws so that the opening at the top is reduced sufficiently to prevent the wrench from falling below the top of the nut. This can be done easily by center punching the edges. This does not in any way reduce the usefulness of the wrench. —A. M. Chester.

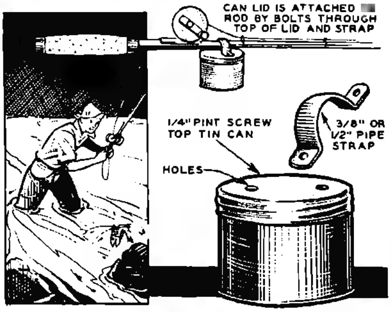

PUNCH MARKS
BOX WRENCH
BURRS

NEW ANGLES FOR THE ANGLER

Bait Can Carried On Fisherman's Belt


TIN CAN - FRUIT, VEGETABLE OR COFFEE
CUT SLITS THROUGH SIDE OF CAN NEAR TOP
BELT THROUGH LOOP

FINDING a satisfactory means for carrying bait when fishing amidstream has caused no end of disgust for many fishermen. A simple way to solve the problem is to make a bait can that can be carried on the belt. A tin can with a smooth top provides a suitable container for the purpose. Slot it along the side with a can opener or chisel and spread the slot with a screwdriver to receive the belt.—A. H. Waychoff.

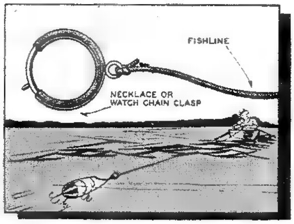

CAN LID IS ATTACHED TO ROD BY BOLTS THROUGH TOP OF LID AND STRAP
1/4" PINT SCREW TOP TIN CAN
3/8" OR 1/2" PIPE STRAP
HOLES

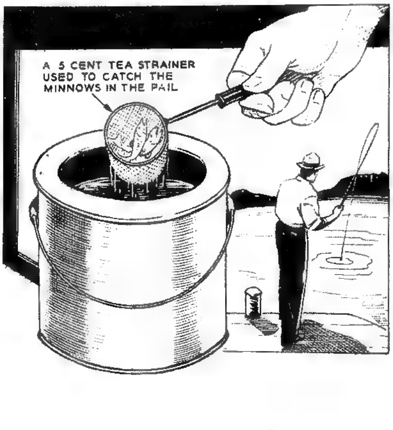
Leader Box Clamps To Fishing Rod

AN ALUMINUM screw top container, such as used by druggists for salve preparations, makes a convenient receptacle for carrying leaders. A tin or copper strip is bolted to the lid of the container so as to permit it to be attached to fishing rod.

Jewelry Clasp Aids In Attaching Lures

FISHERMEN who find occasion to change their lures often can avoid tying and untying the line each time by using small jewelry clasps. Being inexpensive, they may be permanently attached to each line for use whenever the occasion arises.


FISHLINE
NECKLACE OR WATCH CHAIN CLASP

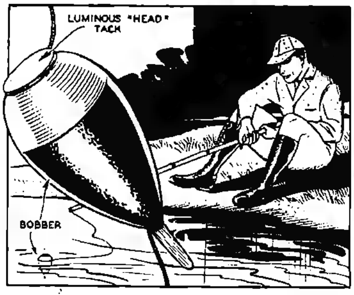

A 5 CENT TEA STRAINER USED TO CATCH THE MINNOWS IN THE PAIL

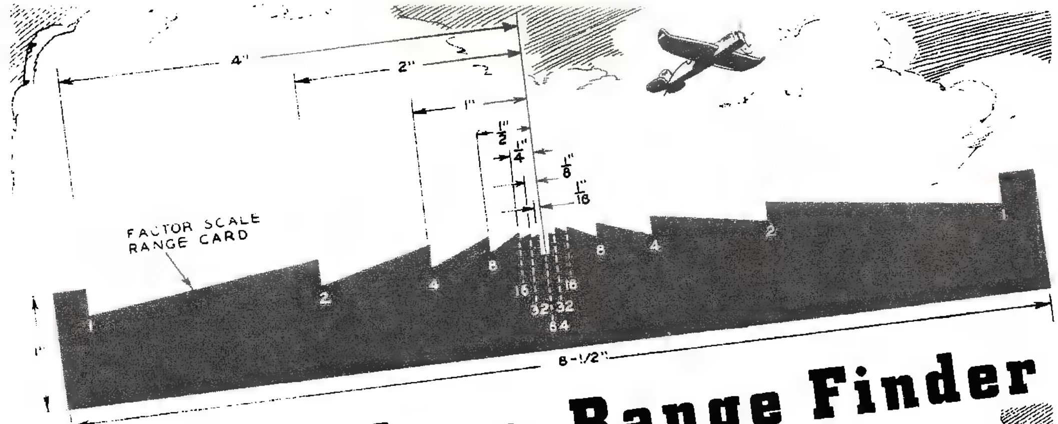
Tea Strainer Used As Minnow Dipper

TO FACILITATE the removal of live bait from the minnow pail, an ordinary five-cent tea strainer is recommended. Ordinarily, it is necessary for the angler to "fish" around in the pail, with his hands, in order to remove one of the elusive minnows. After landing the bait, it is no uncommon occurrence for it to slip through the angler's wet hand and gain long-sought freedom. Use of the tea strainer will pay for itself over and over again. A 1 gallon paint can with lid perforated with nail holes serves as a convenient and inexpensive live bait pail.—A. H. Waychoff.

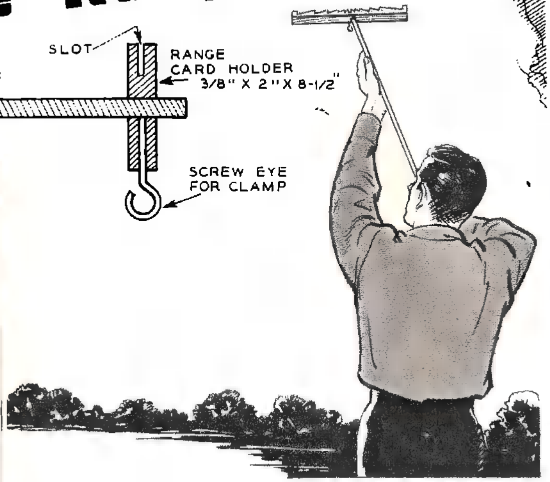
Luminous Bobber For Night Fishing

UNLESS night fishing is done under moonlight, it is next to impossible for the angler to watch the movement of the bobber. With this handicap, it is impossible to "play" the line until a fish has actually "struck." Embryo or veteran need not be dismayed by darkness. Luminous tacks pushed into the top of the bobber will show its location and movement even on the darkest night.—A. Tempe.


LUMINOUS "HEAD" TACK
BOBBER



A Model Plane Range Finder


SLOT
RANGE CARD HOLDER 3/8" X 2" X 8-1/2"
36" X 3/8" DOWEL FOR HANDLE
SCREW EYE FOR CLAMP

MANY model airplane enthusiasts would like to know the maximum height attained by their little craft. By following the instructions given here anyone can easily make a simple and surprisingly accurate altitude finder.

The first step is to lay out a factor scale on stiff cardboard about 8½x1-inch in size. Draw a center line and on each side of it mark off the distances $\frac{1}{16}$, ⅛, ¼, ½, 1, 2 and 4 inches along the edge. Notch these points as shown in the accompanying illustration, and mark them as indicated.

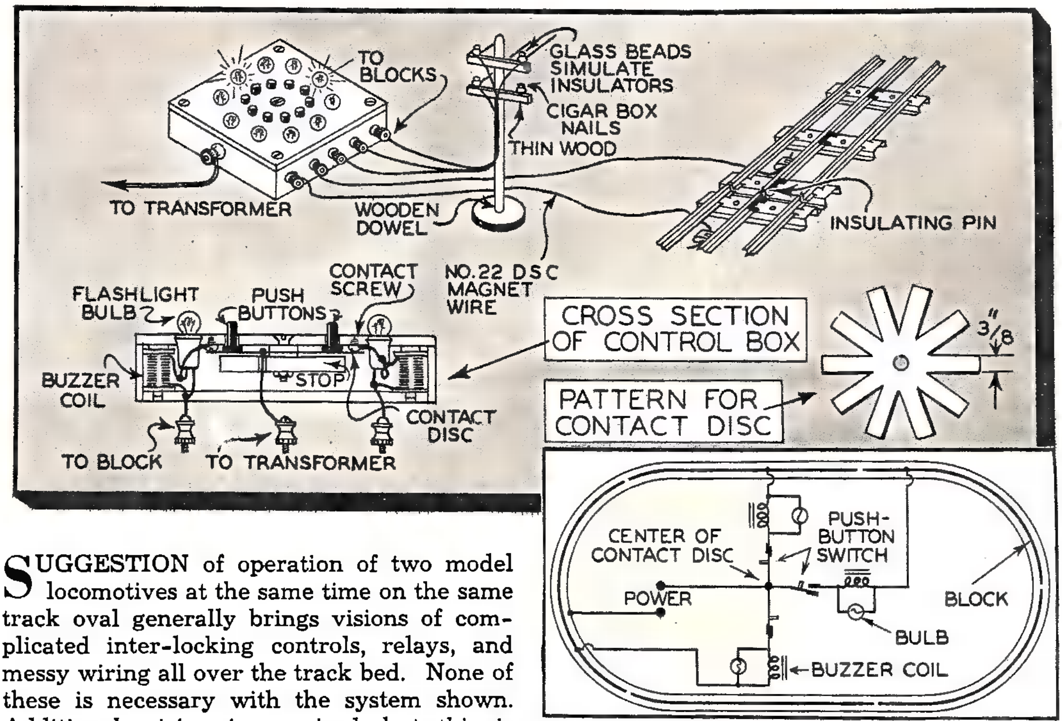
Next, obtain a piece of doweling rod about 36 inches long with a ⅜-inch diameter, and a strip of soft wood ⅜x2x8½-inch. Scribe two center lines, lengthwise and across the strip, and where they join bore a hole large enough to let the dowel slide easily through it.

Now, lengthwise of the edge of the strip saw a slot about ½-inch deep into which the cardboard scale is inserted, first coating its edge with glue, and then making sure the center line of the scale and the center line of the strip match up. Through the other edge of the wooden strip run a brass screw eye and blunt the point. This will act as a clamp to hold the sight rod in position.

To use the finder put your model plane on the ground at any convenient measured distance, say 30 feet. Sight along the rod and move the factor scale to a position where the plane wing-tips just fill the space between points 1-1. Clamp the scale here.

When the plane is up in the air, again sight on the wing-tips and note what space they now fill. Suppose they appear to be just wide enough to fill the space between points 8-8. Then 8 is your factor to be multiplied by ground distance, 30 feet, giving 240 feet as the altitude of the plane. The ground distance can be varied to suit, but, remember, always multiply known ground distance by measured scale factor.

OPERATING TWO TRAINS ON ONE TRACK


TO BLOCKS
GLASS BEADS SIMULATE INSULATORS
CIGAR BOX NAILS
THIN WOOD
TO TRANSFORMER
WOODEN DOWEL
INSULATING PIN
FLASHLIGHT BULB
PUSH BUTTONS
CONTACT SCREW
NO.22 DSC MAGNET WIRE
CROSS SECTION OF CONTROL BOX
3/8"
BUZZER COIL
STOP
CONTACT DISC
TO BLOCK
TO TRANSFORMER
PATTERN FOR CONTACT DISC
CENTER OF CONTACT DISC
PUSH-BUTTON SWITCH
POWER
BLOCK
BULB
BUZZER COIL

SUGGESTION of operation of two model locomotives at the same time on the same track oval generally brings visions of complicated inter-locking controls, relays, and messy wiring all over the track bed. None of these is necessary with the system shown. Additional wiring is required, but this is carried on dummy telegraph poles.

The track is laid off in blocks of three sections each (the distance usually required to bring a train to a complete stop). The third rail of each block is insulated from that of every other block by a fiber pin or a match stick.

Each block has its own third rail wire from the control box. Normally, current flows uninterrupted to all blocks, but when a push button in the control box is depressed, the current in the corresponding block will be interrupted and the train will come to a stop in that block.

As the train progresses around the oval, its progress will be followed on the control box panel by the flashing of small lights beside the block buttons. The position of a second train will also be indicated by lights. When the lights approach each other too closely, it is necessary only to press a button between lights and stop the following trains.

The operation of the follower lights is entirely automatic.

The connection of the buzzer coils may excite some curiosity. One is connected in series with the third rail wire to each block, and a follower lamp is connected in parallel with (across) each "magnet." Quotation marks are placed around the word *magnet* because the coils are not used as magnets at all, but as impedance coils. Their resistance to passage of alternating current is utilized to provide a small voltage drop, which is sufficient to operate a 3.8 volt flashlight bulb.

The impedance of each coil is so small (less than one ohm) that no slowing of the train will be noticed.

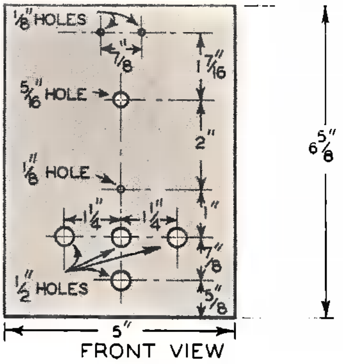
The operation of the train follower is very simple. As the blocks are independent, when there is no locomotive on a block, there will be no current through the buzzer coil and hence no light. As soon as a locomotive enters the block, however, current will be drawn through the corresponding coil and its lamp will light. The other lamps will of course remain dark unless there is a locomotive on another block, in which case its lamp will light.

A little examination will show that the control box is nothing more than a circle of circuit-breaker push buttons. It may be made of wood or any insulating material. An ordinary piece of tin will be sufficiently elastic for the multiple contact disc. Note that

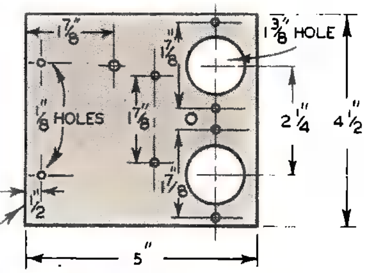
[*Continued on page* 138]

THE "2-3"

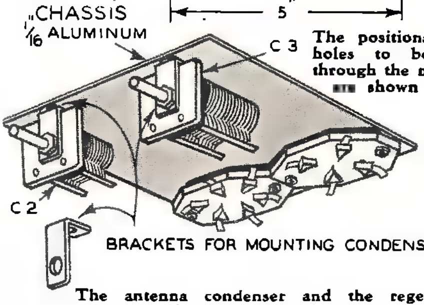
The completed set in use. The binding post at the left is for the antenna connection. All batteries are in the cabinet.



If the parts specified are used, the layout above should be followed. This view is of the front of the all-metal cabinet.



The positions for the holes to be drilled through the metal base are shown above.



The antenna condenser and the regeneration control condenser are mounted to the under side of the base. The bracket for C2 must be insulated from the chassis by means of fibre washers top and bottom. Metal washers should be used with the bracket for C3 so that the chassis rests level.

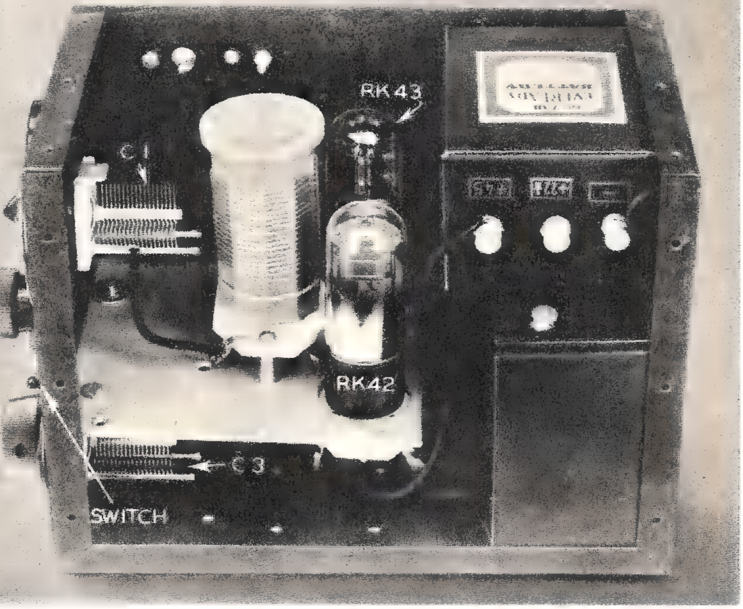
WHEN warm weather brings the urge to spend more time outdoors, some radio fans hesitate to build a portable receiver because of the cost and trouble of construction. However, with this set, neither of these problems is of large proportion. The cost of parts is sufficiently low so that almost any experimenter will find that the pocketbook is not strained very much. When the junk box is brought out and examined for possible parts that can be used, usually the final cost will be reduced to a very few dollars. The actual construction is simple enough so that a single weekend of work will result in a completed set, ready for use wherever its owner wishes to take it.

There is nothing tricky or odd about this receiver. It uses new tubes, but these are really "old tubes" with a different type of filament. These tubes are designed for battery service and operate on 1.5 volts, thus permitting the use of a single "A" battery. The space thus conserved means that the set is much more compact and weighs considerably less than previous types of portables. The complete set, including everything but the earphones, is contained in a split metal case 6¾ inches high, 5 inches wide and 8¾ inches deep. This case is available at most radio supply stores. The builder may want to use some other type of construction, whereby the earphones can be housed in a small compartment; he will find many other sizes and types of cases available, or he may even go so far as to construct his own case of wood. If so, a metal panel is recommended

PORTABLE

by G. W. Shuart

Two tubes give three-tube performance in this easily constructed portable receiver.

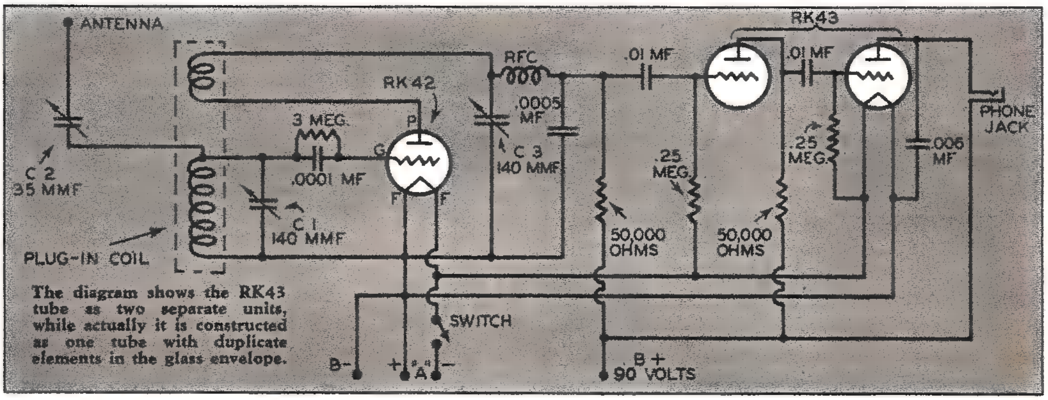

RK43
C
RK42
C3
SWITCH

This photograph shows the position of the batteries inside the set. The tuning condenser is mounted on the front of the cabinet, while the other two are mounted below the chassis. The various small parts—condensers and resistors—are supported by their own wires on the underside of the chassis.

to reduce "hand-capacity" effects. A piece of $\frac{1}{16}$″ aluminum 5″x4½″ is used for the subpanel. The midget condensers C2 and C3 are mounted underneath this aluminum plate. When they are fastened to the front of the case, they serve as a support for one end of the chassis. This makes a very convenient arrangement and it is necessary to employ only a long screw to support the rear of the base plate. The entire r.f. and audio portion is built on this small base.

The antenna condenser C2 and the regeneration condenser C3 are mounted on the under side of the base; so are the two tube sockets. The coil socket is mounted on top. This arrangement is absolutely necessary because the three sockets are so close together that they would interfere with each other if they were all mounted on the top of the chassis. Place small washers between the underside of the chassis and the tops of the tube sockets, to prevent the rivets on the latter from "shorting" against the aluminum. Raise the coil socket about ¾″ above the chassis by small collars or piles of washers.

[*Continued on page* 147]


ANTENNA
C 2
35 MMF
PLUG-IN COIL
3 MEG.
.0001 MF
C 1
140 MMF
RK 42
P
G
F
F
RFC
.0005
MF
C 3
140 MMF
.01 MF
RK43
.01 MF
.25
MEG.
50,000
OHMS
50,000
OHMS
.25
MEG.
.006
MF
PHONE
JACK
SWITCH
B-
+
"A"
-
B +
90 VOLTS

The diagram shows the RK43 tube as two separate units, while actually it is constructed as one tube with duplicate elements in the glass envelope.

CRAFTSMAN'S METHOD of MAKING PITCHERS

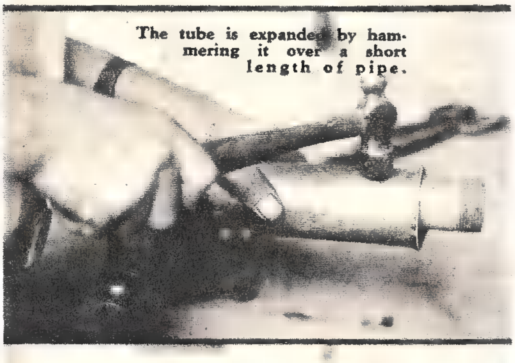
EVERY art shop has an assortment of copper pitchers, few of which are hand made, yet, the making of a copper pitcher is simple, requiring no more effort or skill than many other hand made metal pieces.

For the short pitcher, a 4″ length of tubing is used. The metal is thoroughly annealed, and while resting on the anvil, one end is driven in evenly all around, gradually tapering toward the other end.

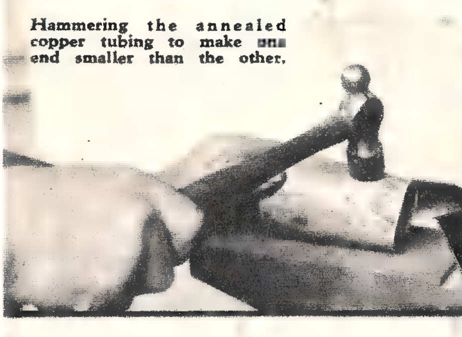
The piece is annealed and the operation repeated several times, until the end is reduced to about 2″. Then the tubing is placed over a length of 2″ iron pipe and the other end is expanded about ½″. The top is trimmed with tin shears to about the right shape, and then the spout is formed over the horn of the anvil, working from the inside.

A disk of 18 gauge copper is cut to fit tightly into the bottom, and soldered in place. The handle is cut, hammered, drilled and riveted on. The rivets should be of soft

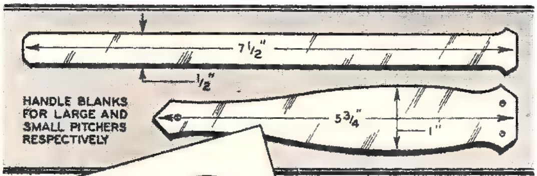
[*Continued on page* 147]



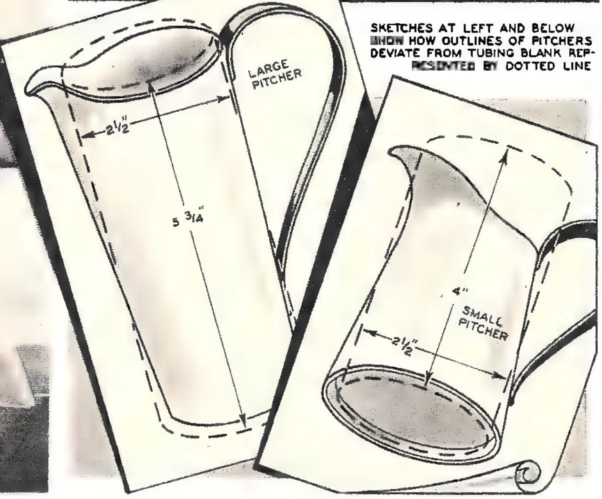
The tube is expanded by hammering it over a short length of pipe.



Hammering the annealed copper tubing to make one end smaller than the other.



HANDLE BLANKS FOR LARGE AND SMALL PITCHERS RESPECTIVELY

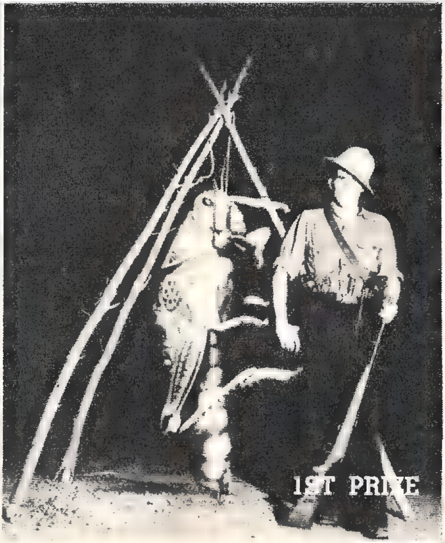


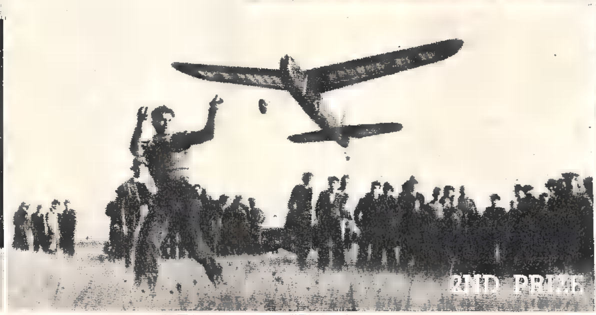
SKETCHES AT LEFT AND BELOW SHOW HOW OUTLINES OF PITCHERS DEVIATE FROM TUBING BLANK REPRESENTED BY DOTTED LINE

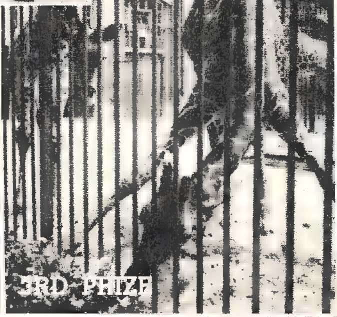
MECHANIX ILLUSTRATED
PHOTOGRAPHY SECTION

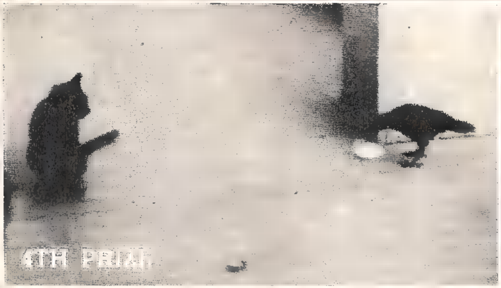
PAGES 119-142

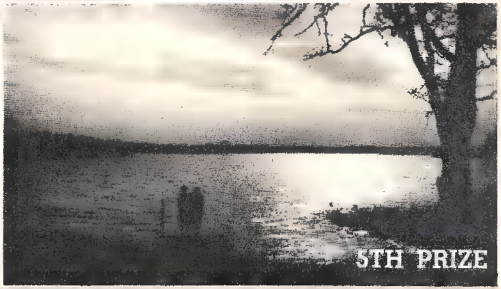
1st Prize—$15—to Howard Anderson, 413 Pacific Ave., Miles City, Mont., for this startling "photomontage", printed from two superimposed negatives. Both pictures were taken against a black background, with two photofloods. Hunter and tripod were shot at distance of 15 feet, 5 seconds at f.8 on S.S.pan film in 9x12 cm. pack camera. A big close-up was then made of grasshopper, ¼ second at f.8. The two negatives were cemented together carefully and printed as one. This is a clever stunt, with many possibilities. 2nd Prize—$10—to Henry Clark, [illegible] Ft. Washington Ave., New York, N. Y., for this fine action shot of a model plane at the moment of launching. Pictures like this are not easy to make, as the plane moves so quickly. 3rd Prize—$5.00—to Rudolph Boger, 3111 Glenwood Road, Brooklyn, N. Y., for this unusual photo of a giraffe doing his stretching downward instead of upward! Caught with a Super Ikonta B, 1/50 second at f.8, S.S.Pan film. 4th Prize—$5.00—to Donald Clements, Kennessey, Okla., who ran for his Kodak Bantam and snapped this rare picture of a black crow sipping a black cat's milk while the cat looks on in astonishment. Shutter speed, 1/50 second, at f.6.3, on a sunny day. 5th Prize—$5.00—to Ellis Butler, Bowie, Tex. The beautiful moonlight effect was produced by over-developing the print. Negative was made in a 120 Ansco camera using super-sensitive panchromatic film, 1/50 second at f.32. Tray developed for five minutes in D-52 developer; print on Vitava paper.


1ST PRIZE


2ND PRIZE


3RD PRIZE


4TH PRIZE


5TH PRIZE

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully, put your name and address on each, and include postage if you want them returned. Address all contributions to Photography Editor, **MECHANIX ILLUSTRATED**, 1501 Broadway, New York, N. Y.

What To Do About

Above: Taken with the same camera, these pictures show that the view finder is definitely out of line and needs adjustment. Below: Bringing the camera too close to the subject sometimes gives this effect.

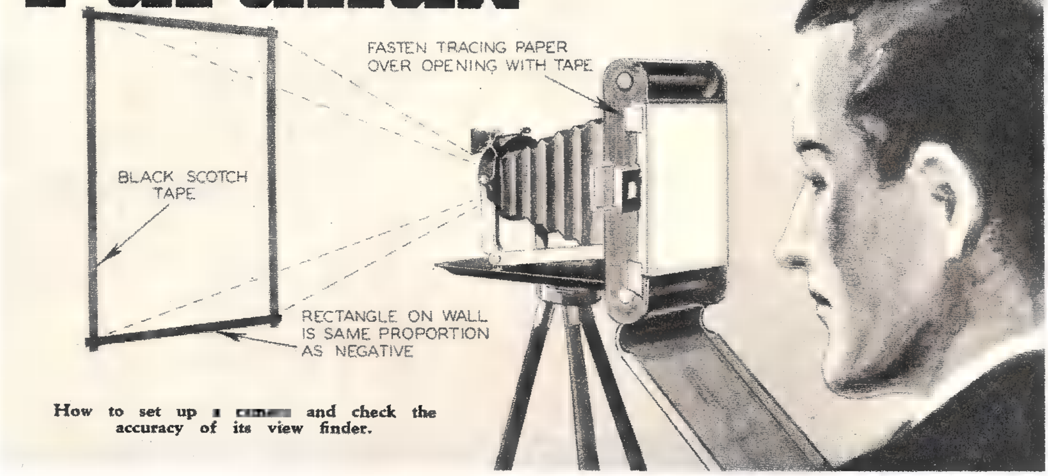
PRACTICALLY all cameras fitted with eye-level view finders suffer from a common trouble known as "parallax." Though not many camera owners recognize this word, they probably all have sworn plenty at it.

Parallax is the displacement of the image as seen in the view finder in relation to the actual image as recorded on the film. You hold the camera to your eye, squint carefully at a person six or eight feet away and move the camera around until you think everything is showing. When you develop the roll, you discover to your dismay that part of the head or legs is cut off, or the figure is off center completely. The error usually is greatest when close-ups are attempted at distances of three to five feet, which is about as close as most cameras will work without supplementary lenses.

With miniature cameras parallax is a particularly serious matter because the whole negative area is small enough even if all of it is used. If it is necessary to back away from the subject a good deal in order to be certain of getting a whole head, for instance, on the film, the resulting image is tiny and must be "blown up" considerably if a print of decent size is to be made. Beyond about fifteen feet the trouble practically disappears, as the ratio of displacement becomes very small. Most eye-level view finders are very accurate from infinity focus to ten, twelve or fifteen feet (depending entirely on the particular camera), not quite as accurate at slightly shorter distances, and quite inaccurate for intimate close-ups. A permanently fixed view finder is thus something of a compromise.

The makers of the more expensive minia-

Parallax


FASTEN TRACING PAPER OVER OPENING WITH TAPE
BLACK SCOTCH TAPE
RECTANGLE ON WALL IS SAME PROPORTION AS NEGATIVE

How to set up a camera and check the accuracy of its view finder.

tures frankly and honestly tell people what to expect in this regard. For camera fans who want to be absolutely certain of what they are "shooting," they supply separate, attachable view finders having micrometer adjustments that eliminate parallax entirely. The system is as follows: First you look through the range finder and focus carefully on the subject. You observe the distance on the lens barrel or focusing mount, and then simply turn the parallax adjustment to read to this same figure. What you then see through the special view finder is exactly what you will find later on the negative.

The only catch to this ideal arrangement is that the view finders are practically miniature cameras in themselves, with finely corrected optical elements, and cost about $25.

Fortunately for the owners of more modestly priced cameras, it is a very simple matter to determine the accuracy of any view finder at specific distances, and to make approximate but adequate provision for the parallax.

For your test "image," select any light colored blank wall in any convenient room. In any stationery or chain store, buy a ten-cent roll of black "Scotch tape." This is like the old-fashioned gummed mending tissue you used in school to fix up torn pages in books, but it requires no wetting and is instantly removed from any surface without leaving marks. Set up the camera on a tripod or on the edge of a table. Adjust the focusing device so that the lens is out to the maximum—the camera is thus set for taking pictures at its shortest possible distance. No film is needed; open or remove the back of the camera and by means of rubber bands or strips of the Scotch tape hold a piece of tracing paper, tracing cloth, a fine silk handkerchief, or even ordinary tissue paper over the space normally occupied by the film.

The idea is to mark off a rectangle on the wall with the black tape and to illuminate it with any strong light; a photoflood is fine. The rectangle should be in proportion to the negative size. For instance, if the film measures 2¼x3¼ inches, the black "frame" can be about 4x6 feet. Put a dark cloth over the camera, open the lens wide and set the shutter at "T" (time) and move the camera around until you can clearly see the black box on the improvised focusing screen. Line it up carefully so that it covers the full negative area; if necessary, adjust the tapes to form a smaller or larger outline that fills the negative at the shortest focusing distance.

Now lock the tripod adjustment and move your eye to the view finder. The extent of the parallax with your particular camera will then be instantly evident.

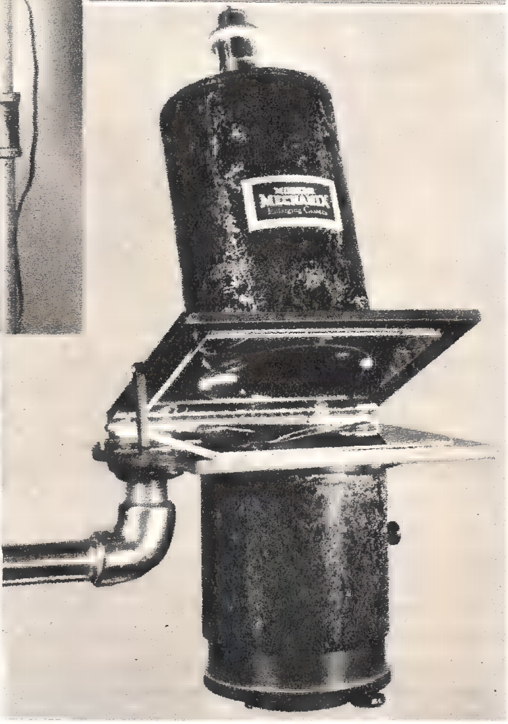
Repeat the experiment with the camera moved back from the wall at various distances, and at each stage, draw a rough pencil sketch showing how much "off" the finder is. You will then know how much to tilt the camera, and in what direction, in order to be reasonably certain of having the negative cover the desired subject at the critical short distances.

[*Continued on page* 141]

The MI "Minineg"

Negatives from 35 mm. to 2¼ x 2¼ inches are handled with ease and can be "blown up" 10 diameters.

The upright is a 31" piece of 1" pipe, attached to a 5-ply baseboard, 14x18", by a 1" floor flange. The 1" Tee, with its threads filed off, slides on this pipe; a thumb screw on opposite side locks it in any position. A ½x4" nipple joins enlarger head to sliding Tee by means of 90 degree elbow.



The enlarger open, ready to receive negative. Film is simply placed, emulsion side down, on the lower glass; hinged top, section of enlarger is then closed down, thus flattening the negative and keeping it in position.

TEN-DIAMETER projection prints made with the "Minineg" enlarger have that crisp, wire-sharpness that you usually expect only of contact prints. This trim-looking, compact little device is versatile. It will enlarge miniature negatives up to 2¼x2¼ inches in size and, like the 9x12 cm. MM Enlarger described in the March, 1938 issue, will handle small sections of larger negatives.

The Minineg follows somewhat the design of the 9x12 cm. enlarger, and uses the same baseboard and upright; a single bushing for the 1-inch tee makes them interchangeable. The unusual compactness is due to the use of a 50-c.p. automobile headlamp bulb, which is extremely *cool* in operation but supplies an adequate volume of light. Two 3-inch plano-convex condensers, located almost in contact with the negative, assure unusual brilliance and crispness of detail.

In constructing the Minineg, three types are available for selection. They differ only in appearance, design and operation being identical. The cheapest to make is the Regular; then there are the Deluxe and the Super-deluxe. Exclusive of condensers and projection lens, you can make the Regular for less than a dollar; the materials consist of ¼-inch black tempered Prestwood, with focusing and lamphouse tubes formed of sheet metal. Materials for the Deluxe, which is shown in the illustrations, consist of a black Bakelite radio panel and Bakelite tubing of the kind used for winding radio coils. Lastly, for the Super-deluxe, use Catalin. This can be obtained in sheets and tubes and the cost will not run over several dollars. This beautiful plastic material is obtainable in many colors and will not require outside finishing or lacquering if a non-actinic red mottle shade is chosen. A special cement is desirable, although Duco cellulose cement will hold the Catalin parts quite well.

You can get a pair of 3-inch unmounted condensing lenses for $1.50, and a good projection lens will cost from $5.00 up. Used and

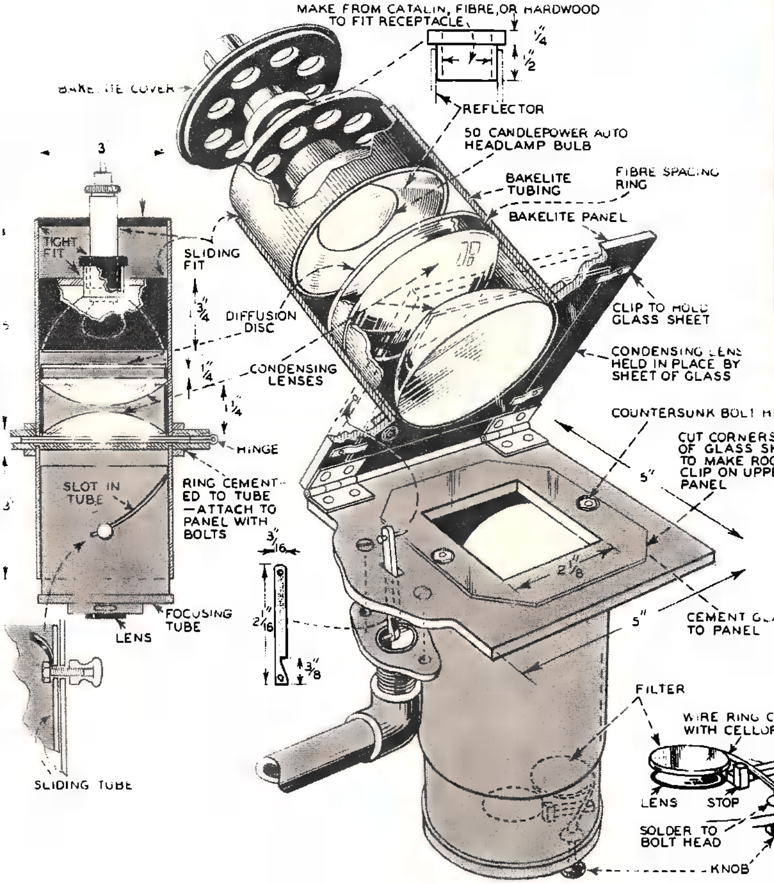
ENLARGER

by Kenneth Murray

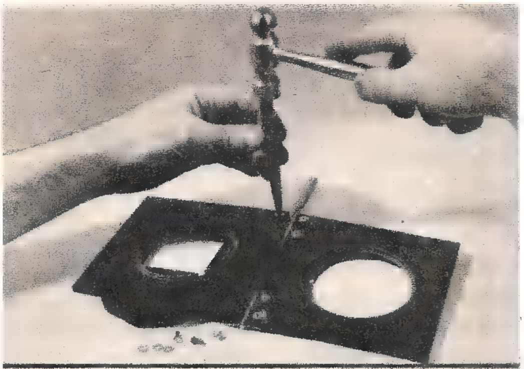
new bargains are continually offered by the larger camera shops. A 3- or 3¼-inch anastigmat with aperture of f. 4.5 is standard for the Minineg. A shutter is not necessary.

The Deluxe Minineg is shown in the illustrations, and with the drawings you will not find that construction is at all difficult. You can get the Bakelite panel at any radio supply house, but to secure the correct sizes it was necessary to purchase the Bakelite tubing from two different concerns: 3-inch (*inside diameter*) tubing was secured from Allied Radio Corp., and 3-inch (*outside diameter*) tubing from Wholesale Radio Service Co., both in Chicago. The latter tubing makes a very smooth fit inside the former, and the price is only 7c an inch, and less in 1-foot

The lamp unit. Holes in the cover provide good ventilation.


MAKE FROM CATALIN, FIBRE, OR HARDWOOD TO FIT RECEPTACLE
¼"
½"
REFLECTOR
BAKELITE COVER
50 CANDLEPOWER AUTO HEADLAMP BULB
BAKELITE TUBING
FIBRE SPACING RING
BAKELITE PANEL
3
TIGHT FIT
SLIDING FIT
1¾"
DIFFUSION DISC
CLIP TO HOLD GLASS SHEET
CONDENSING LENS HELD IN PLACE BY SHEET OF GLASS
1"/4
CONDENSING LENSES
1¼
HINGE
COUNTERSUNK BOLT HEAD
CUT CORNERS OFF OF GLASS SHEET TO MAKE ROOM FOR CLIP ON UPPER PANEL
5"
SLOT IN TUBE
RING CEMENTED TO TUBE —ATTACH TO PANEL WITH BOLTS
3/16"
2⅛"
2 1/16"
⅜"
FOCUSING TUBE
LENS
CEMENT GLASS TO PANEL
5"
SLIDING TUBE
FILTER
WIRE RING COVERED WITH CELLOPHANE
LENS
STOP
SOLDER TO BOLT HEAD
KNOB

Above — How the Minineg is focused. The left hand turns the focusing tube in or out, and the right one locks it by means of a binding post nut and a short machine screw passing through both the fixed and sliding tubes. (See extreme lower left detail in accompanying drawing.) Left—Phantom cut-away view of the entire enlarger. Study this carefully before starting construction and you will have no trouble. Note particularly how the lower Bakelite panel mounts to the short piece of piping by means of a small flange, a short nipple and a 90 degree elbow. These are inexpensive fittings.



Top—Riveting the hinges to the Bakelite negative holder. Above—Cementing the glass sheets in place. Old glass plate negatives are suitable for the purpose.

lengths. From either of the above sources you can obtain small cans of radio (phenolic) cement, and crinkle lacquer.

If you have a lathe, the parts are easily turned and the tubing accurately cut with special chucks. However, equally satisfactory work can be done with a 10c coping saw; no special equipment is required to make the Minineg. In setting the small hollow rivets for the hinges, use a prick punch to first enlarge the open end of each, then finish with a hammer. The butt hinges should allow the two parts of the negative holder to be exactly parallel with two sheets of thin glass between; for this reason it will probably be necessary to file down the rivet heads. If the parts are not then parallel, press the hinges in a vise, being sure to protect the Bakelite with small pieces of cardboard.

To attach the 4-inch squares of glass, place a drop of cement at the four corners of each; then carefully drop them in place, so that the cement spreads out somewhat, and allow it to dry over night. These glasses, for sandwiching the negative, are mainly intended for holding negatives smaller than 2¼ inches square. If all negatives to be enlarged are 2¼ inches square, or larger, the glass can be omitted and the Bakelite made to meet evenly so as to grip the edges of the film.

As the top half of the glass negative sandwich bears the weight of the lower condenser lens, cement alone may not hold satisfactorily. It is a simple matter to provide a more positive support in the form of small spring clips fastened to the upper Bakelite panel by means of screws or rivets, as the detailed drawings on page 123 show.

The safety bracket or stop on the left side of the enlarger head is a narrow piece of Bakelite, notched at one end so that by pulling it forward with a finger when the holder is opened, the notch will engage and hold the surfaces apart for changing negatives. The device will disengage when the top of the enlarger is lifted slightly.

Solder a brass sleeve to a suitable 3-inch reflector (one from an old flashlight will do) and enamel the inside white. You will find that the 50-candlepower headlamp bulb has the manufacturer's insignia stamped opposite the base, and this must be removed by either buffing lightly and carefully on a wheel, or by rubbing briskly with a cloth

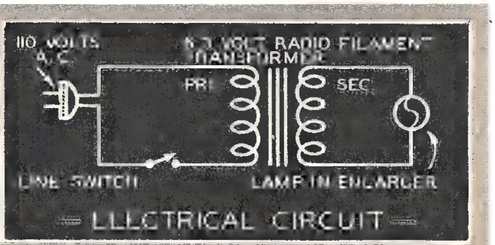
Circle—Grinding the round diffusion glass with valve grinding compound and water. Left—The slot in the inner focusing tube is cut with a short piece of scroll saw blade, and smoothed with the nailfile.

charged with metal polish. The socket can be obtained at an automobile supply store, or from an old headlamp. Other parts, and the manner of fitting them together, are made clear by the drawings.

A ground glass diffusion disc may or may not be necessary, according to the curve of the reflector. Even illumination must be secured. To make a removable diffuser, cut a disc of glass by running a glass cutter around a wood-disc template. On a lathe, the glass can be chucked and the cutter held against it, on the steadyrest, while the arbor is given one full turn (and no more) *by hand*. Make straight cuts from the circle to the edge of the glass, before attempting to part it. The ground finish is easy to secure; place a dab of valve-grinding paste on the disc, add a drop of water, and rub it with a circular motion on another sheet of glass. More water must be added frequently. To correct a bright spot cast by the reflector, grind a spot in the center of the other side of the disc.

A 3¼-inch (focal length) lens was used on the enlarger illustrated, and the drawings give the correct measurements of the focusing tube for that lens. A 3-inch lens will cover the negative adequately, however, and in this case the minimum extension should be about 3 or 3⅛ inches and the maximum extension 4½ inches. This measurement is figured from the negative to the lens, and it will allow enlarging in excess of 10 diameters, or as little as 2 diameters when desired.

Drill a hole at each extreme of the focusing range of the inner tube, then paste a strip of gummed paper on either side, between the holes, as a guide for cutting the slot for the tightening nut and bolt. Slight adjustments can be made later when the lens-holding disc is cemented in position. A disc of red or amber celluloid or cellophane serves as a filter for use while the paper is being adjusted on the baseboard; a touch on the notched wheel serves to place the filter in or out of position.

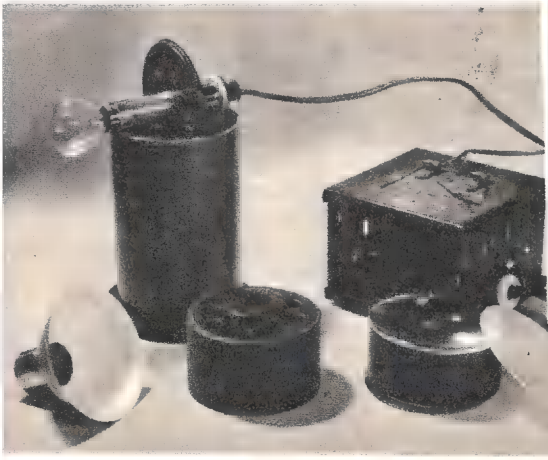


How the radio or train transformer is connected to the house line. The switch is most conveniently mounted on the table or set in the enlarger base.

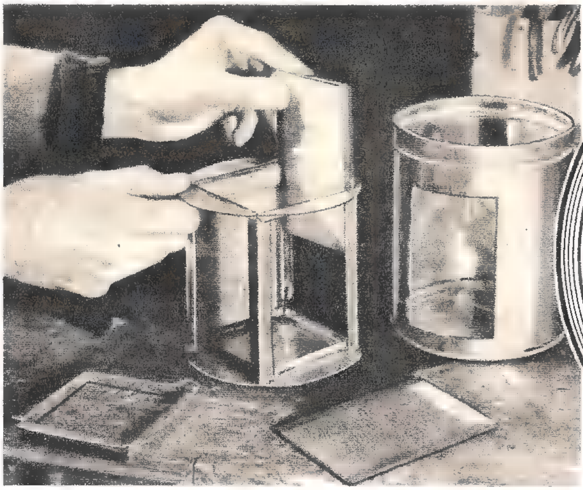
In finishing the enlarger, the Bakelite parts should be polished and the lamphouse and outer focusing tube coated with black enamel. Crinkle lacquer, as used on radio parts, gives a very attractive appearance, but you should practice applying it beforehand, on waste stock.

Although a 6-volt battery will supply current for the lamp, which makes it ideal for automobile travel, for practical home use a small transformer is desirable. A toy train transformer or a radio filament lighting transformer is ideal; 6 or 8 volts is the recommended rating, and this will supply plenty of light with *very little heat.*

When first setting up the Minineg the lamp must be adjusted in the reflector, and the reflector must be brought to the right distance from the condensers, in order to secure even illumination.



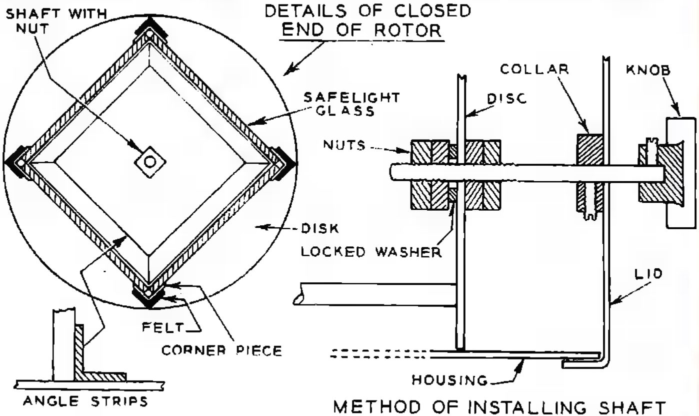
Left—Parts for the lamp-house, and the toy train transformer used for power. Above—How the Bakelite lens disc is cemented into the focusing tube. Notice the simple red filter, which covers the lens while the enlarging paper is being positioned.



ROTARY SAFELIGHT LAMP

by Walter E. Burton

The photograph above shows clearly how the four-position safelight operates. Although light passes through all the safelights at one time, it passes out through the housing through only one section at a time. The corners of the rotor are padded with strips of felt to prevent the possibility of light leakage.



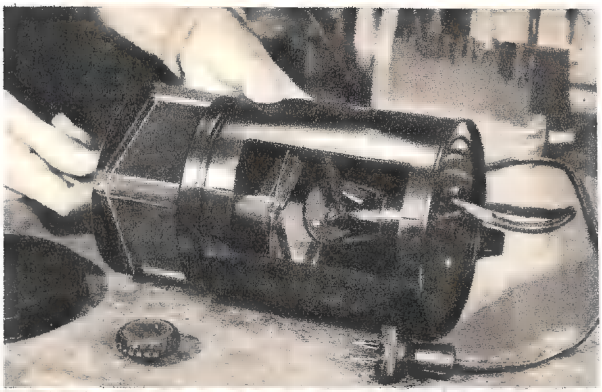
DETAILS OF CLOSED END OF ROTOR

METHOD OF INSTALLING SHAFT MADE FROM 1/4" BOLT

THE usual photographic darkroom arrangement of a single safelight lamp whose color screen must be slipped out and another one inserted every time a different type of paper or film is to be developed, can become a distinct nuisance, particularly when the changeover is attempted with wet hands. A rotary safelight lamp similar to that illustrated will eliminate such trouble by permitting screens to be changed merely by the turn of the knob.

This four-position safelight unit consists of a rotor, carrying standard safelights, that revolves inside a cylindrical housing having a rectangular opening in the side. A single lamp in a surface-mounting socket projects into the rotor, light from it passing through all the safelights at once, but emerging from the housing through only one at a time. Corners of the rotor, which has a square cross section, are padded with felt strips, to prevent light leakage.

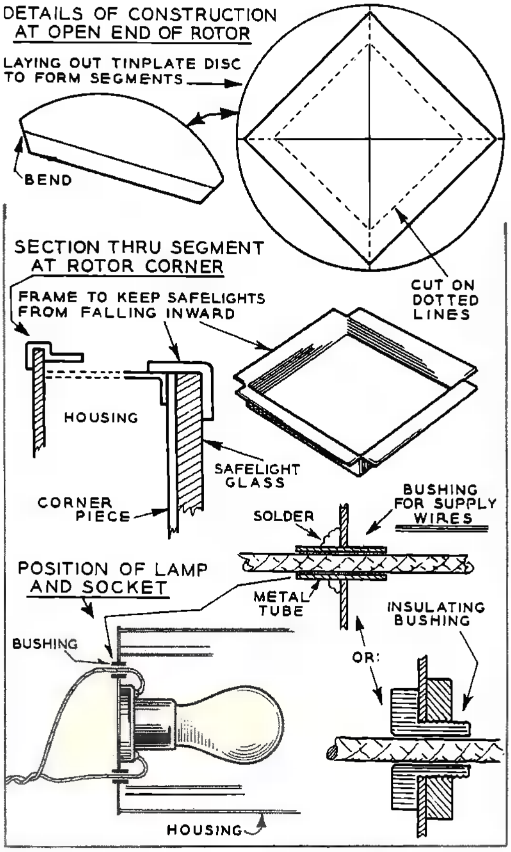
Among the materials needed are the following: One empty can of the type in which 5-pound quantities of sodium sulphite and sodium carbonate are sold by photo dealers, and measuring about 5¼ inches in diameter by 6¼ inches deep; a quantity of tinplate for the rotor (empty tin cans can be used); one ¼-inch bolt 3 inches long; radio knob, to fit end of bolt after head has been removed; 4 strips of felt ½ inch wide and 5 inches long, preferably dark in color; one small angle bracket similar to those used for bracing corners and supporting shelves; one surface-mounting lamp socket and a 15-watt lamp,



SAVES DARKROOM TIME

with necessary cord and plug; four rectangular safelights each measuring 3¼ by 4¾ inches; miscellaneous materials including black lacquer, solder, and casein-latex cement or similar adhesive for fastening felt to metal.

Obtain the safelights and build the rotor to fit them, and at the same time fit it inside the can that is to become the housing. Wratten safelights are standard in this country, and can be purchased for about 40 cents each in the size specified. For complete flexibility with all photographic materials, the following are needed: Series OO, a clear yellow color, for use with contact-printing papers; Series OA, greenish yellow, for use with bromide enlarging paper and lantern slide plates; Series 2, red, for use with orthochromatic films and other materials sensitive to green but not red; Series 3, green, for use with panchromatic plates and films. For the extremely rapid panchromatic films that have been placed on the market recently, development in total darkness is best.


DETAILS OF CONSTRUCTION AT OPEN END OF ROTOR
LAYING OUT TINPLATE DISC TO FORM SEGMENTS
BEND
CUT ON DOTTED LINES
SECTION THRU SEGMENT AT ROTOR CORNER
FRAME TO KEEP SAFELIGHTS FROM FALLING INWARD
HOUSING
SAFELIGHT GLASS
CORNER PIECE
SOLDER
BUSHING FOR SUPPLY WIRES
POSITION OF LAMP AND SOCKET
METAL TUBE
INSULATING BUSHING
OR:
BUSHING
HOUSING

Cut two discs of tinned sheet iron, such as that from the sides of an empty tin can, of a size that will permit them to be inserted, flatwise, into the housing. In the center of one disc drill a ¼-inch hole, to receive the bolt to which the knob used to rotate the safelights will be attached. Mark out, on this same disc, a square whose sides are about 1/16-inch longer than the width of the safelights. Cut four pieces of tin to the same length, and about ⅜-inch wide, and bend them lengthwise along their center lines, to make right-angle pieces. Solder these to the disc as shown, to form a square frame against the outside of which the ends of the safelights will rest.

Cut four strips of tin measuring 1 by $4\frac{13}{16}$ inches, and bend them at right angles along their center lines, to form corner pieces of the rotor. Set the safelight glass temporarily in position outside the square frame, place the corner pieces outside the glass, and mark the places where the ends of these pieces meet the disc. Remove the glass and solder the corners in place, applying solder only along the outside, so it won't pile up near the glass.

Mark the other disc with a square the same size as the first one, and then make a smaller

[*Continued on page* 136]

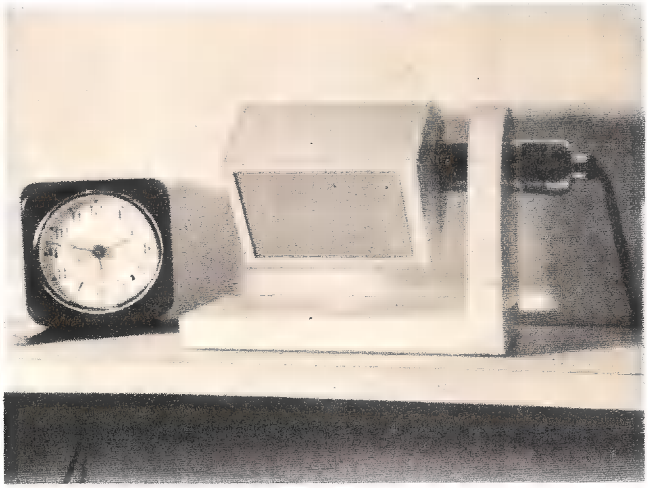
Photo

Developer Temperature Is Easily Regulated

If you do your developing in the bathroom, it is a simple matter to maintain an even temperature of solutions in a tray. Simply float the latter in the hand basin, adding hot or cold water as indicated by the thermometer. Be careful water doesn't splash into the tray.

Simple Wooden Stand Improves Brownie Safelight

A simple stand for a Brownie safelight can be made from two pieces of wood, as shown at right. Make the mounting hole slightly smaller in diameter than the end of the socket which receives the lamp and then increase the diameter of the hole gradually with a file until the socket can be pushed through it in a snug fit. Glue, smeared on hole rim, will aid in anchoring the socket.



Tape On Lens Gives Stereoscopic Effect

A strip of Scotch tape pasted on the front of a lens, as shown at left, will "fuzz" the background of any picture, making the object or person in the foreground stand out like a stereoptican picture. Tape should cover about one-fourth of the lens.

Good Flash-Bulb Fires "Dead" One

A flash-bulb that fails to go off in the usual manner can be made to fire by arranging it so that the glass part just touches that of another good bulb (right). The "dead" bulb will fire when the good one goes off, its flash occurring only about 1/100 second later.

Short Cuts

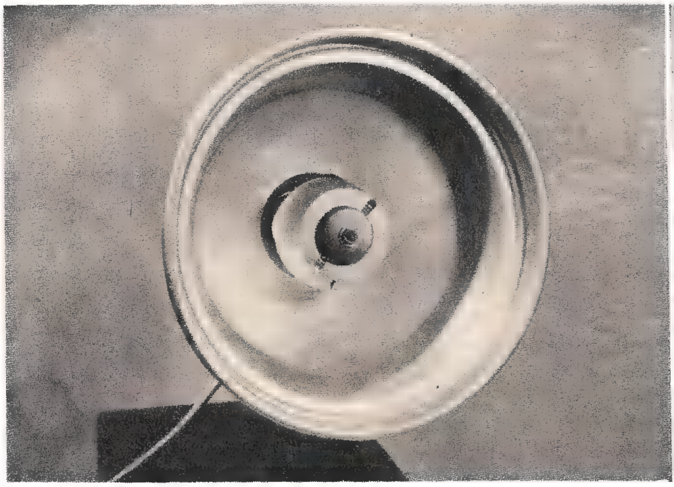
How To Grind Glass For Photo Use

Make your own ground glass for enlargers, etc., by rubbing any paste abrasive between glass sheets with a circular motion (above).

Clothespin Serves As Thermometer Handle

Checking the temperature of developer solution in a large bottle with a slippery stirring rod is risky, especially when the fingers are wet. Clipping a spring clothespin on the thermometer, as shown above, will provide a satisfactory handle and lessen chance of breaking the thermometer.

Lamp Shade Clip Improves Reflector



It is sometimes difficult to make good pictures of people indoors with photoflood lamps unless the latter are diffused in some manner. A lamp shade adapter with its center hole covered by a washer and bolt (above) makes an ideal "cap" to clip over the end of a bulb so that only light from the reflector shines on the subject.

●

Large prints can be vignetted smoothly and cleanly, fading out to a perfect white at the edges, by a chemical method instead of the usual dodging method. Expose the print without masks or dodging, dip into plain water and then dip the finger in developer solution and rub it over the part to be brought out (right). →

Chemical Method Of Vignetting Prints

kid stuff

by ROBERT HERTZBERG

THE only sensible advice that can be given to people who want to photograph children is: Shoot often and shoot a lot. Children are restless creatures, and change their moods and expressions from one minute to another. The successful child photographer needs a lot of film and a lot of patience, and the willingness to expend both.

The most cherished pictures are those made while the child is eating, walking, playing or doing something else that is normal for its age. The most uninteresting baby shots are those made with the squirming victim tied into a studio seat, in an unaccustomed setting of arc lights and painted backgrounds. The subject should not even be conscious of the presence of the camera, and should never be told to "Hold it!" or to "Look at the birdie." Baby pictures must be shot on the wing, so to speak. Many will be complete misses, but some are bound to be good. The photographer who obtains two or three negatives out of a 36-exposure roll over which he really can exclaim, "These are beauties!" is really enjoying a high degree of success. Film is cheap, so blaze away!

If the child is your own, no preparatory work is necessary. Just keep a loaded camera handy and be ready to use it whenever lighting conditions permit. If the subject is some other person's offspring, it is a good idea to become acquainted with the child, by means of several preliminary visits, before you go to work in earnest. Some of the successful professional child photographers make a practice of studying a child's habits over a period of several days or even a week, and then arrange to do their actual shooting either indoors or outdoors when the child's activities present the best photographic opportunities.

At what age is a child ready for the camera? As soon as it is old enough to keep its eyes open for more than two minutes at a time! The parent-photographer who shoots a roll or more of film every single weekend, beginning when the baby is two weeks old, eventually compiles an absolutely priceless record of human development. Babies grow and change with such amazing rapidity that only the permanent pictures made by a camera can help their parents remember what they looked like one month, two months or six months back.

Taking pictures outdoors is, of course, no problem. However, the really "cute" shots are those of Junior or Little Dimples in his or her bath, crawling on the floor, spattering cereal over the kitchen, sparring with a kitten or puppy, thumping the piano, building block houses, riding piggy-back on Daddy, or doing any of the dozens of other mischievous things that babies have always done. Lighting becomes a problem, but certainly not a difficult one in these days of super-super speed negative materials and photoflood and photoflash lamps. The minimum requirement is probably two photofloods in adequate reflectors, plus a camera with at least an f. 4.5 lens and loaded with fast film. A little experimenting with exposure speeds on the first roll will quickly tell if the light is bright enough.

Although they appreciably reduce the volume of usable light, diffuser screens of thin tracing cloth are highly advisable, as they remove the cruel glare of the bulbs and make an anxious mother feel more comfortable.

The ideal outfit for child photography is a camera equipped with a synchronized flashgun, permitting flash exposures up to 1/200 second. This speed will "freeze" any natural movement of even the most active child, and will shorten shooting time. However, the advisability of using flash bulbs is open to question. Some children are frightened by the sudden, blinding stab of light, and go screaming to their mothers' skirts. For this reaction they hardly can be blamed; many adults are half-frightened out of their skins even when they are prepared for the flash. Some children, on the other hand, think the flash is a new kind of game, and enjoy it hugely. Try one flash experimentally and see how the intended "victim" reacts.

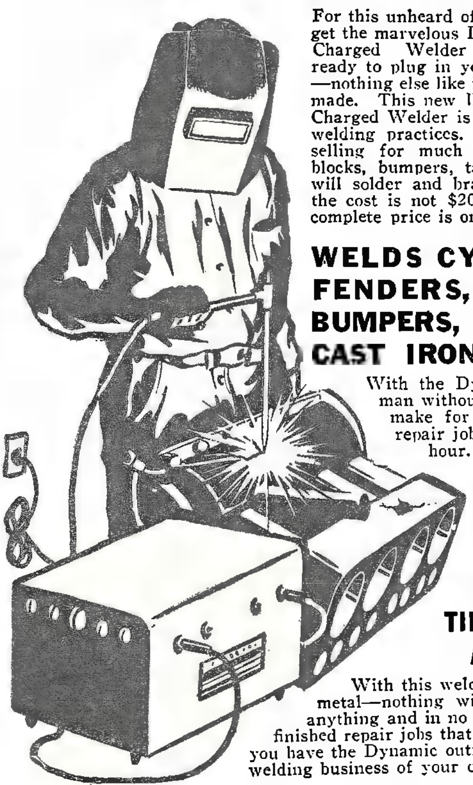
Incidentally, flash bulbs are known to shatter occasionally because of the intense heat created inside the glass bulbs by the ignition of the foil. It isn't a pleasant possibility to think about, but one such experi-

[*Continued on page* 138]

NOW.. a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

WORKS OFF 110 VOLT ELECTRIC LIGHT CIRCUIT

for Only $19.75 RETAIL



For this unheard of price, you can get the marvelous Dynamic Super-Charged Welder complete—all ready to plug in your light socket—nothing else like it has ever been made. This new Dynamic Super-Charged Welder is a radical departure from accepted welding practices. It will do the work of welders selling for much higher prices—such as cylinder blocks, bumpers, tanks, etc., and at the same time will solder and braze on the lightest material—and the cost is not $200.00 or $100.00—think of it, the complete price is only $19.75.

WELDS CYLINDER BLOCKS, FENDERS, AXLES, BODIES, BUMPERS, FARM MACHINERY, CAST IRON RADIATORS, ETC.

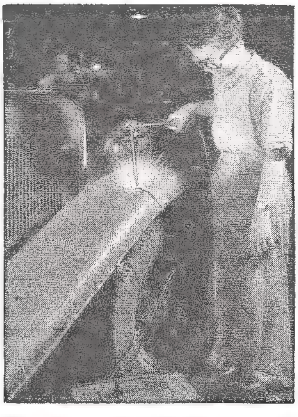
With the Dynamic Super-Charged Welder, a man without previous welding experience can make for himself as much as $5.00 on a repair job that can be done in less than one hour. Many welders make as much as $15.00 to $20.00 a day. Despite its serviceability, the Dynamic Welder is light and easily portable—can be carried around by hand and set on the running board of any car you are working on.

WORKS ON IRON, STEEL, TIN, BRASS, COPPER AND ALL OTHER METALS.

With this welder you can work on all kinds of metal—nothing will stump you—you can tackle anything and in no time at all you will be able to do finished repair jobs that will do credit to an expert. Once you have the Dynamic outfit, you are all set in a profitable welding business of your own—you boss it yourself.

DOES METALLIC AND CARBON ARC WELDING

Can be used efficiently on both types of welding. The cost of using the Dynamic Super-Charged Welder is amazingly low—costs only a few cents an hour to operate. It is built so strongly that repairs are practically unknown—you'll never have to worry about them. It cools so efficiently that you can use it continuously without ever having to stop in the midst of a job to let it cool down.



These pictures show how easy it is to operate the Dynamic Super-Charged Welder. A ten year old boy can do a swell fender repair job—an inexperienced man soon can do all kinds of welding.

READ WHAT USERS SAY

Electrician says: "It is the best welding outfit."
I wish to tell you that I demonstrated your welding outfit to a great many people, and they all agreed with me that it did the best welding job they ever saw. A. L., Bristol, Conn.

Mechanic Praises Welder
I have received my welder and like it very much. I am a mechanic and electrician by trade, so I can appreciate its usefulness to others. P. C., Perry, N. Y.

Repair Shop Owner Tells About Dynamic
I want to say I operate a repair garage and I am more than satisfied with the welder. It will do more than you say. C. P., Butler, Ohio.

Greatest Portable Outfit
I must say it's the greatest portable outfit any man could wish to own. You may put me on file as a booster. W. J. B., St. John, N. B., Canada.

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Do you want something easy to sell? You can make big profits introducing to garages, factories, mechanics, janitors and maintenance men the new Dynamic Super-Charged Welder—we'll let you try it for ten days at our risk so you can be convinced of the immense sales possibilities. Get our big profit plan and ten day trial offer. Just send coupon below and mail it TODAY.

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Gentlemen:

You may send me full particulars on your big profit plan and 10 day trial offer.

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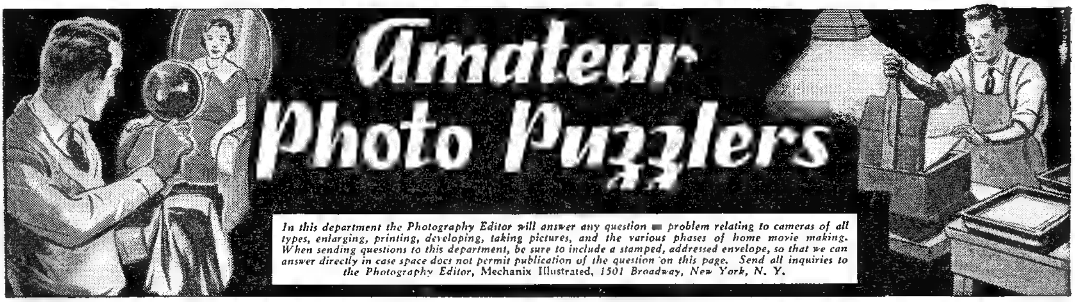


Amateur Photo Puzzlers

In this department the Photography Editor will answer any question [redacted] problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Mechanix Illustrated, *1501 Broadway, New York, N. Y.*

STOPPING ACTION

I have a camera with an f. 4.5 lens. To stop action I snap it at 1/100 second. Could I [redacted] the lens opening [redacted] f. 6.3 or f. 8 and get better results? When I have it [redacted] f. 4.5 fast action is [redacted] little blurred.—Joe Felice, Coal Center, Pa.

What you must do to stop action is set the shutter for [redacted] faster exposure, say 1/200 or 1/300 second. Closing down the lens diaphragm will only make matters worse, as this will reduce the amount of light admitted to the camera and will make the negatives underexposed, without affecting the "stopping" action of the shutter in the slightest. If the fastest adjustment on your camera is 1/100 second, your action pictures will be somewhat limited in scope.

REMOVING EMULSION FROM OLD PLATES

A commercial photographer recently cleaned out his darkroom and gave me several dozen glass plate negatives in the 5x7 and 8x10 sizes. How can I remove the emulsion easily, so that I can use the glass for making a contact printer, a negative sandwich for an enlarger, [redacted] retouching easel, etc.? A chemical method, whereby the plates [redacted] dipped into a solution of some kind, is desired.—J. P. L., Fort Worth, Tex.

Soaking the plates in hot caustic soda or potash solution is the recommended chemical method. The solution is diluted to a hydrometer reading of about 10, and is used in a large glass container or vessel. Soak the plates until the emulsion is loosened, and then rinse them thoroughly in hot water. Of course, rubber gloves and aprons must be worn to protect the hands and clothing. The compounds sold under various trade names for cleaning toilet bowls and other ceramic fixtures consist largely of caustic soda and are obtainable in most hardware stores at low prices.

ACETONE FOR CELLULOID TANKS

I want [redacted] make those interesting celluloid developing tanks described in your December 1937 issue, but am having trouble obtaining the acetone called for. Can you help me? —A. Sinai, San Francisco, Cal.

Acetone is a common and inexpensive chemical, widely used [redacted] finger-nail preparations. Your local drug store undoubtedly has it [redacted] stock and will sell you small quantities.

DARKROOM LOCATION

The only two places in the house where I can build [redacted] darkroom are [redacted] large clothes closet and [redacted] corner of the basement. The closet is next [redacted] the chimney and is quite hot most of the year. On the other hand, the basement, which has a dirt floor, frequently becomes damp. Which location would you recommend?—R. Stotter, Bridgeton, N. J.

The basement location will be better than the closet. Although excessive heat and humidity are both harmful to negatives and sensitized paper, it is much easier to enclose these materials in waxed paper envelopes or other tight containers than it is to ventilate and cool a windowless closet. Furthermore, developing and fixing solutions are definitely damaged by excessive heat, whereas they are not affected in the slightest by occasional spells of high humidity, for the simple reason that they are liquid anyway and are kept in corked bottles. The availability of a convenient supply of water in the basement is another important factor.

To protect your feet from dampness, build up some sort of a rough floor. Level off the earth, tramp it down [redacted] hard [redacted] possible, and then cover it with a layer of crushed cinders about two or three inches deep. Over this place [redacted] wooden platform made of scrap lumber of any sort. Paint the boards generously with as much creosote [redacted] they will absorb; this will prevent rotting. A wooden floor is preferable to cement, tile or stone because it is much easier on the feet.

FINDING FOCAL LENGTH OF LENS

I have [redacted] lens from [redacted] old camera that I would like to use in [redacted] home-made enlarger, but I do [redacted] know its focal length. There is no marking on it. Is there any simple way of measuring the focal length?—A. H., New York.

The familiar old "burning glass" stunt should be helpful. Using the sun or an unshaded electric bulb as the light source, move the lens back and forth in front of an upright piece of white cardboard until [redacted] sharp image or bright spot appears on the latter. This distance between the lens and cardboard, as measured in inches, is the focal length.

SLIDES FOR PROJECTION

How [redacted] I prepare small sheets of glass to take a positive image, so that I can project pictures on the wall? I understand that sensitizing solutions can be mixed using standard photographic chemicals.—"Lecturer", Chicago, Ill.

It is quite unnecessary to prepare your own plates. Lantern slide plates, which measure 3¼x4 inches, have been on the market for many years, and are easily printed, developed, and fixed just like contact prints. If your local camera dealer doesn't have them in stock, he can order them for you.

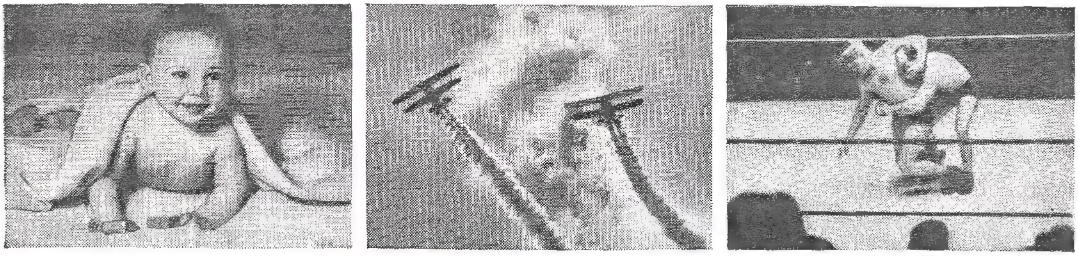
USING PROJECTOR AS ENLARGER

I [redacted] buy a used "silent" motion picture projector very cheaply, but before doing so would like [redacted] know if it can be rebuilt conveniently [redacted] act [redacted] an enlarger for miniature [redacted] film.—Phil Miller, Brooklyn, N. Y.

Probably not. First of all, miniature "still" cameras using 35 mm. motion picture film take [redacted] double-frame image; the projector is designed only for the standard movie single frame. Second, the focusing arrangement does not have enough extension for making enlargements only [redacted] foot or [redacted] from the lens, as the projector was designed to throw images the length of a theatre. Third, most projection lenses are not sufficiently corrected for the making of fine still pictures. All in all, the best thing to do is to buy or make an enlarger intended specifically for the purpose you have in mind.

MECHANIX ILLUSTRATED AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month [redacted] the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars [redacted] garding these awards will be found in this issue [redacted] page 119.

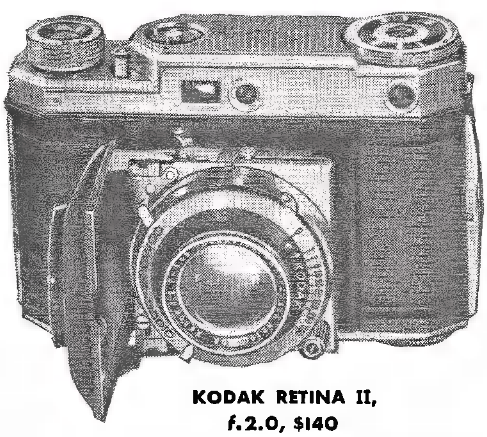


"Slices-of-life" shots, speed shots, scenics, night work, full color . . . count on Retina

Call your shots . . . name your price

There's a Kodak Retina that's right for you

If your first camera, or your next camera, is to be a miniature, and you're looking about for one at your price that will give you all the pictures you plan to take—including gorgeous full-color Kodachrome—consider a Kodak Retina. There are three Retinas, all with the fast lenses and shutters, the speed and ease of operation, and the wide picture-taking scope necessary for brilliant work in the miniature field. At your dealer's . . . Eastman Kodak Co., Rochester, N. Y.

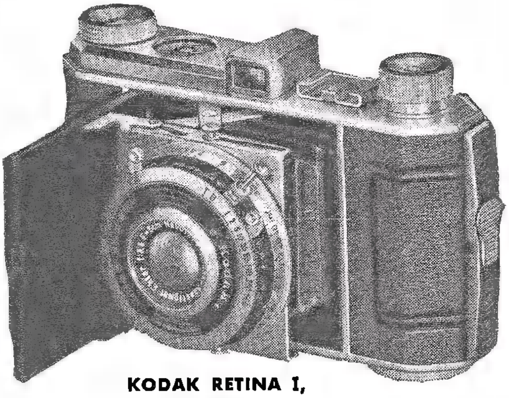


KODAK RETINA II,
f.2.0, $140

Coupled range finder. Body shutter release. Double-exposure prevention device. Automatic exposure-count dial. Lens, anastigmat *f*.2.0. Shutter, 1/500 Compur-Rapid. Price, $140 (with sportsman's field case).

KODAK RETINA II,
f.2.8, $115

Identical with Kodak Retina II, *f*.2.0, except that lens is an anastigmat *f*.2.8. Price, $115 (with sportsman's field case).



KODAK RETINA I,
f.3.5, $57.50

Lens, Kodak Anastigmat EKTAR *f*.3.5. Shutter, 1/500 Compur-Rapid. Finger and special plunger releases. Enclosed optical eye-level finder. Exposure counter. Price, $57.50. Soft black leather case, $1.50. Tan sole leather field case, $8.50.

LOAD WITH A WIDE RANGE OF KODAK FILM

KODAK PANATOMIC—Fine grain permits an amazing degree of enlargement. 18- and 36-exposure magazines.

KODAK "SS" PAN—Lightning-fast. Ideal for snapshots at night. 36-exposure magazines.

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Only EASTMAN makes the KODAK

Science Is King!

[*Continued from page* 38]

one case—that of Goethe—many people forget that he was a Privy Councillor at the Weimar court and an able administrator. But his mind was the only one in Europe comparable to that of Leonardo da Vinci. He was a poet, humanist and a pathfinder in the realm of Natural Science. The other name that comes to mind is that of Benjamin Franklin, inventor as well as statesman. His experiments will always be rated as a landmark in the history of electricity. In general, however, it is safe to say that all progress in mechanical as well as other science has been made in spite of statesmen. Most statesmen have stood for traditionalism. Their attitude is exemplified in the action of the Holy Office in 1633, which brought Galileo Galilei to trial and with torture made him recant and deny the scientific discoveries he had made.

If we examine the history of scientists and scientific discoveries, we will find that man did not really begin to think straight until the arrival of the mechanical age. Up to that time, practically all human thinking had been deductive. That was the weakness of even the greatest minds among the Greeks—the reason why they remained so backward in a mechanical sense. They were deductive thinkers, reasoning from the general to the particular. It was the mechanical scientists who started us thinking inductively, from the particular to the general.

Bertrand Russell, in his brilliant work, "The Scientific Outlook," attributes the beginning of modern thought to Galilei. When he discovered the four moons of Jupiter, with his primitive telescope, he did far more than add a little bit to the world's astronomical knowledge. He established beyond doubt the truth of the theory that Copernicus had hit upon himself, but which Copernicus was unable to prove: that the Ptolemaic system, which had governed the world's thought, was all wrong; in short, that our system is heliocentric, that we revolve around the sun.

This seems like a rather dry commonplace to us today. The mere fact that it aroused the wrath of the Holy Office reminds us how electrifying, even how horrifying it was in the Seventeenth Century. It was not only the ecclesiastical authorities who pounced upon Galileo. Some of his own students hissed him at his lectures.

As Bertrand Russell points out, "The conflict between Galileo and the Inquisition is not merely the conflict between free thought and bigotry or between science and religion. It is a conflict between the spirit of induction and the spirit of deduction. Those who believe in deduction as the method of arriving at knowledge are compelled to find their premises somewhere, usually in a sacred book. Deduction from inspired books is the method of arriving at truth employed by jurists, Christians, Mohammedans, and Communists. Since deduction is a means of obtain-

[*Continued on page* 139]

Tricks With Bottles

[*Continued from page* 99]

impossible to push the egg into the bottle because there is no way for the air inside to escape. The problem is solved as follows. Light a small piece of paper and drop it into the bottle, then quickly replace the egg over the opening, standing it upright on one end. The burning paper exhausts the oxygen inside the bottle, creating a partial vacuum which sucks the egg slowly inside! You are now faced with the problem of removing the egg. To do this, raise the bottle to your lips, bending your head back so that the bottle can be inverted. Blow vigorously into the bottle, then suddenly lift it from your mouth. The compressed air which you have created inside will cause the egg to pop quickly out of the opening!

FASTENING LABEL TO INSIDE OF BOTTLE

Transferring a label from the outside to the inside of a bottle is an amusing stunt to show your friends. Moisten the label with water until you can peel it from the glass. Roll it into a small roll (with the writing on the outside) and push it into the bottle, then pour in a small quantity of water. Hold the bottle horizontally and shake it gently. The water will cause the label to unroll and stick firmly to the inside of the glass!

MARBLE OVERCOMES GRAVITY

An interesting puzzle-problem illustrating the principle of centrifugal force can be created with an empty milk bottle and a glass marble. Drop the marble inside. The problem is to turn the bottle upside down and carry it across the room, without permitting the marble to drop out. The trick is done by taking the bottle by the neck and giving it a circular motion causing the marble to run rapidly around the inside. Gradually raise your arm until the bottle is inverted, continuing with the circular motion. The marble will spin about inside the glass, just above the neck, enabling you to transport the bottle and marble where you please!

STRAW HOLDS BOTTLE

Lifting a bottle with a soda straw sounds like a difficult feat, but it is easy when you know the secret. Bend the straw at one end and push this end through the neck so that it will spring open on the inside of the glass as shown in the picture. It is now a simple matter to lift the bottle with the straw.

MYSTERIOUS ROPE TRICK

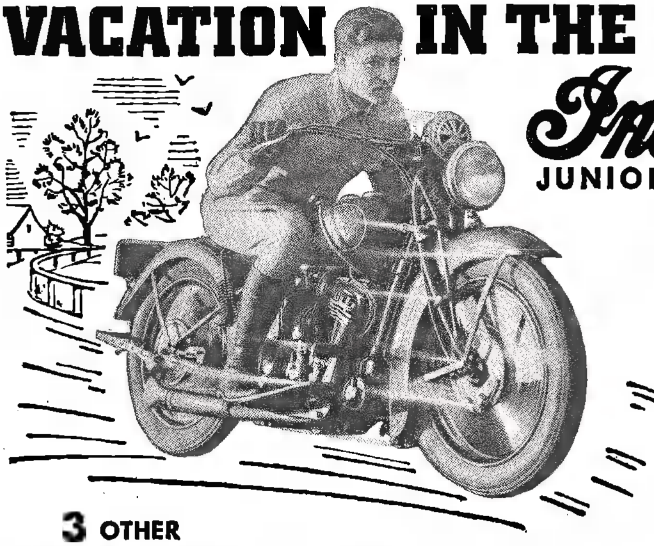
A trick with a bottle and rope has become quite popular recently among magicians. You can prepare it very simply. It requires a small bottle of opaque colored glass, a piece of soft rope about three feet long, and a small piece of

[*Continued on page* 144]

VACATION IN THE OPEN

Indian
JUNIOR SCOUT

F.O.B. FACTORY
$215.
FULLY EQUIPPED



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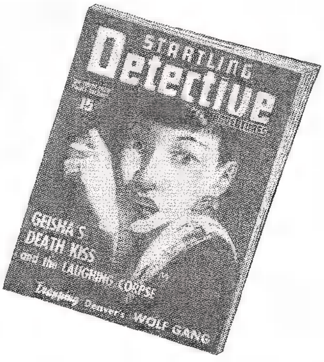

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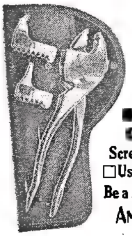

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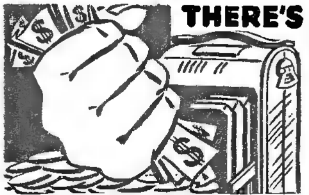

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Built To Win

[*Continued from page* 59]

fuel, have more working parts to go wrong, and are heavier.

Some of the best known drivers in the game will ride behind Offenhauser engines. Such men as Louis Meyers, Kelly Petello, and Wilbur Shaw will stake their chances of winning something upwards of $40,000 on Offenhauser motors.

Asked which driver he thought would win, Offenhauser was noncommittal:

"They're all good drivers. It's anybody's race. The Indianapolis grind is one sporting event that's never in the bag. I'll tell you the winner when he gets the checkered flag. Sometimes I prefer to have a conservative driver behind my motor. On the other hand, it's a thrill to see your motor stand up under the punishment one of the daredevil drivers will give it. After all, I build my motors to win—not to keep for pets."

What causes a racing motor to break down? There are as many reasons as there are parts. Sometimes you get a plague of broken connecting rods, then it's the valves; again it may be the timing chain. Recently, however, the chief trouble has been with overheating. When a driver is pushing the throttle hard, his engine may overheat to the point that the oil vaporizes, causing an extra stop to re-fill the crank case.

This trouble was particularly acute in 1937 because of the heat wave which settled over Indianapolis on the day of the race. To compensate as much as possible for weather conditions many drivers study a barometer and humidity gauge before adjusting their motors for the race. You can't stop very often at Indianapolis—and get away with it. You have to do your figuring before hand. That's what makes the builders of racing motors get gray.

It takes a great driver to win at Indianapolis, but no driver can finish in the money if his motor won't stand up. The result of the race this year is in the lap of the gods that govern life and death on the oval—but the power plants won't fail—if human genius and patience can prevent it.

Rotary Safelight Lamp

[*Continued from page* 127]

square inside it and about 1¼ inches smaller all around. Draw diagonals of the squares, extending them to the edges of the disc. Cut out four segments, by following the boundaries of the smaller square, and the diagonal lines to the disc edge. Bend the tin at right angles along the lines made when the first square was marked. Solder the four segments to the free ends of the corner pieces of the rotor, as shown. You now have a framework completely surrounding the safelights when they are inserted into it as shown in the photograph. To prevent the safelight glass from falling inward at the open end of the rotor, make a square frame, with sides bent to form right-angle sections, and insert it so that it projects downward inside the safelights. Fasten the frame in place with solder after the safelights are in place.

With the dimensions given there will be a fraction of an inch clearance between the corners of the rotor and sides of the housing. Glue the strips of felt along these, to build them up to the full diameter of the housing. This provides an adequate light seal. Two or three linen threads wrapped around the rotor will hold the felt while the glue sets, and can be left permanently in place if desired.

At a point in the side of the housing directly opposite one of the safelight areas when the rotor is resting inside, cut a rectangular opening measuring about 2½ by 4½ inches. Flare the longer sides slightly outward, so they will not catch the felt corners of the rotor when it is turned. In the center of the bottom of the can forming the housing, mount the lamp socket, running the wires out through holes bushed with small metal tubes or anything else that will prevent damage to the insulation. Caulk the holes with putty to prevent light leaks. Drill a ¼-inch hole in the center of the can lid. Paint inside of housing and lid black, and the outside any color desired. Solder or rivet the angle bracket to the end or side of the housing, in such a manner that the light opening will be where it is needed in the darkroom—usually directly above the developing area. Exact position of the bracket on the can will depend on particular mounting conditions.

Cut the head from the ¼-inch bolt, and run two nuts on the end until about ½ inch of the threaded portion projects. Tighten the nuts firmly against each other. Insert the end of the bolt into the hole in the closed end of the rotor, and anchor it in place with a lock washer and two more nuts. Insert the rotor into the housing, place the lid in position, with the bolt projecting through its center hole, and mount a radio knob on the end of the bolt, which now has become a shaft.

The safelight lamp is now complete. A quarter turn of the knob will swing a new safelight into position. Check the device carefully for light leaks. You probably will find it necessary to caulk around the safelights a bit. For this, use soft cotton string cemented in position with black lacquer.

Cost of such a safelight lamp, using Wratten color screens, should not exceed two dollars.

The world's worst weather is claimed for the Antarctic—the home of the blizzard.

How planets are born is unknown, but one astronomical theory is that gravitational force may draw a planet from the surface of a star when another star passes close enough.

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Operate Two Trains On Track

[*Continued from page* 115]

connection passes from the terminal of the transformer through the disc to each of the small stub contact screws, thence through the lamp-and-coil combinations to the third rail of each respective block. The other terminal of the transformer is connected to an outside rail as usual.

Number 22 Double Silk Covered Magnet Wire is best for use on the telegraph poles. If the outfit is not set up and taken down often, Enameled Wire will be much cheaper and somewhat more realistic-looking.

Fahnestock connectors taken from old radio batteries were soldered to the third rails, but it is necessary only to "tack" the end of the wire to the rail with solder if no connectors are at hand.

An oval is not the only layout for which the circular controller will function. If other layouts are used, [redacted] cardboard disc may be fastened to the panel and a diagram pencilled on it, indicating the block controlled by each button.

A switch or crossing should not be included in two blocks. Spurs and side tracks may be readily handled as single blocks, switches being included in the main track blocks.

Building "Patty"—8½-Ft. Skiff

[*Continued from page* 98]

and aft. The seat amidships rests directly on the seat riser and is cut to fit the inside beam. This seat is 10″ wide and ¾″ stock.

Make four chocks for the oar locks so that *Patty* may be rowed from the middle or bow seat, or both. Oar chocks are cut to the shape shown out of 1¾″ white oak. Screw metal plates to the tops to prevent chaffing while rowing. Fasten the locks 12″ from the rear edges of the seats with 2″ screws.

Drill [redacted] ⅜″ hole through the stem 6″ from the top for an eye-bolt, to which the bow painter is tied or eye-spliced. Do a thorough sanding job. Then paint or varnish with two coats of yacht white, marine black or spar varnish, respectively, according to preference.

If *Patty* is to be converted into [redacted] sailing dinghy, use the dimensions and details for a detachable fin keel given in the accompanying sketches. An appropriate rig is also suggested in illustration. A hole from the mast should be drilled through the bow seat 10″ from the extreme bow. A half-inch lag screw with the head cut off, resting in [redacted] ¾″ socket, is a fitting mast-step. The mast is ten feet long and 2″ in diameter.

Kid Stuff

[*Continued from page* 130]

ence will end your career as [redacted] child photographer. Take no chances; put [redacted] Cellophane envelope on each bulb or wrap it in [redacted] thin silk handkerchief.

Science Is King!

[*Continued from page* 134]

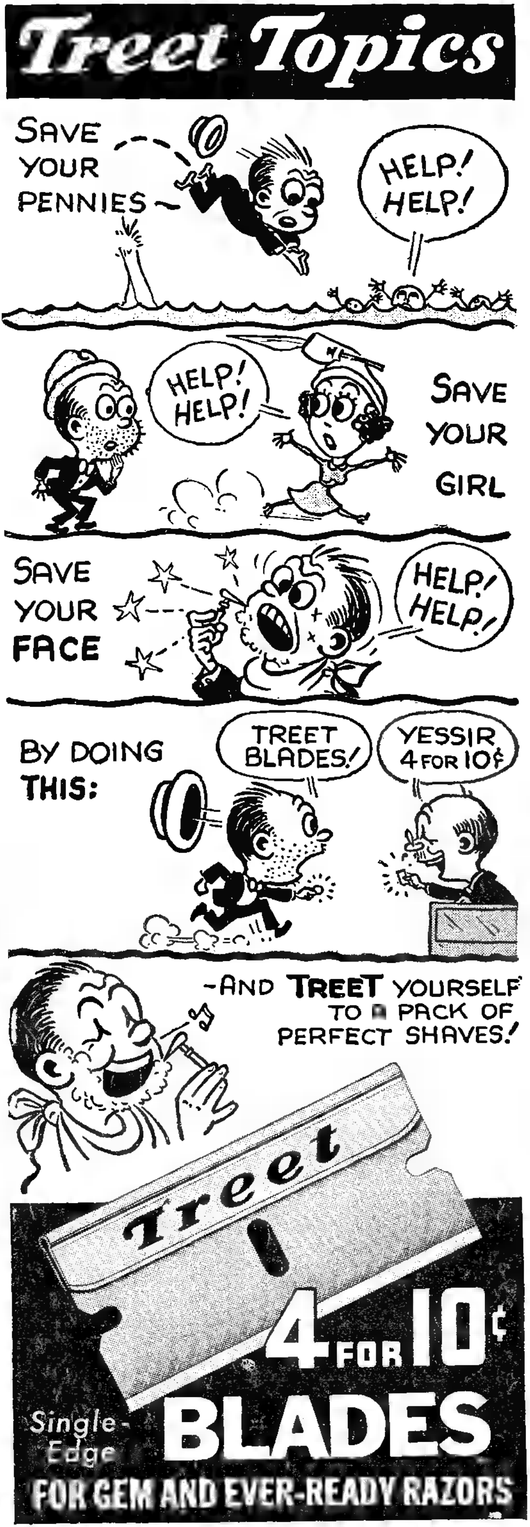
ing knowledge collapses when doubt is thrown upon its premises, those who believe in deduction must necessarily be bitter against men who question the authority of the sacred books. Galileo questioned both Aristotle and the Scriptures and thereby destroyed the whole edifice of medieval knowledge."

Of course there was one good substantial reason for the hostility of the deductive thinkers towards the process of induction. The inductive method requires infinitely more hard, digging, exhaustive work. Each particular fact required for a general conclusion has to be laboriously sought out and established. Galileo almost with one stroke, demolished and made useless the conclusions of those who went before him. Bertrand Russell says further: "As a matter of fact, knowledge is even harder to come by than Galileo supposed, and much that he believed was only approximate; but in the process of acquiring knowledge at once secure and general, Galileo took the first great step. He is, therefore, the father of modern times. Whatever we may like or dislike about the age in which we live, its increase of population, its improvement in health, its trains, motor-cars, radio, politics, and advertisements of soap—all emanate from Galileo. If the Inquisition could have caught him young, we might not now be enjoying the blessings of air-warfare and poisoned gas, nor, on the other hand, the diminution of poverty and disease which is characteristic of our age.

"It is customary amongst a certain school of sociologists to minimize the importance of intelligence, and to attribute all great events to large impersonal causes. I believe this to be an entire delusion. I believe that if a hundred of the men of the Seventeenth Century had been killed in infancy, the modern world would not exist. And of these hundred, Galileo is the chief."

Bertrand Russell ran into a great deal of criticism when he assigned to Galileo such an important place in the history of civilization. To me personally, his idea seems fundamentally sound. At the same time, I admit it's perhaps unfortunate that the credit for certain lines of progress in human civilization should be concentrated so much on a few men. We talk of one man as being the Father of This, and the other as being the Originator of That, and a third as the Discoverer of So-and-So. From the story of exploration we know that all discoveries really are the work of a great number of men, most of whose names have completely disappeared and been forgotten. Geographers no longer believe that Columbus was actually the first man since Leif Ericsson to rediscover America. All human knowledge is the result of a labor of a multitude of workers, many of them obscure. And this is particularly true in the mechanical sciences, par-

[*Continued on page* 162]



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Postmarks As Collector Items

[*Continued from page* 86]

its individual, easily identified postmark.

Sometimes native postoffices have been used by occupation troops, but there have been sectors which have never had such offices. Consequently, "army posts" have had to be created. This was the case during the Boxer Rebellion and army of occupation postoffices sprang up in various sectors, such as between Peking (now Peiping) and Taku. Railroad stations generally became postoffices. Battleships and transports also became mail vessels!

The technical story of war postmarks might fill [redacted] good-sized book. The late Dr. H. A. Coleman compiled a splendid booklet of forty pages on the postmarks of the American armies in France. But today the booklet, though published not many years ago, is obsolete because many new types of markings have been found. These postmarks include those of places of occupation or stationing of U. S. troops, shore stations, war vessels, even of camps and forts in America. The postoffices for the troops were operated in the beginning by the Postoffice Department, but in May, 1918, they were turned over for operation by the army. Thus we find "M.P.E.S." inscribed in many postmarks of the war as an abbreviation for "Military Postal Express Service."

Opportunities For Inventors

[*Continued from page* 63]

Northill Company, Inc., explain the unique operating policy of the company this way: First of all, the inventor never has to relinquish control of his invention. It remains his property and the company makes an agreement with him to pay [redacted] fixed royalty for the privilege of marketing the idea. The inventor is relieved of any and all financial responsibilities, while the company gambles its ability to pick a winner against all the preliminary expense necessary to develop and manufacture the idea into a salable item.

So today there is a growing list of inventors, most of them heretofore unknown, who are being paid through this unusual arrangement.

Among its highly successful products is the Northill light-weight folding anchor for marine and aircraft use.

John K. Northrop, whose engineering pioneered all-metal aircraft construction, now universally adopted, is the designer of this remarkable anchor. Northrop's interest in the organization has continued to grow and now the company retains his services as active consulting engineer and with his staff studies and passes upon all ideas submitted for possible manufacture.

At least 57 of the world's 92 chemical elements are found in steel mills.

The "Mechanix" Arc Welder

[Continued from page 91]

iron is then evenly woven into the open side of the core in order to close it.

The electrode holder consists of an old electric soldering iron handle fitted with a 6-inch disc of pressed wood as a guard. Fit an 8-inch heavy copper pipe into the handle, with one of the welding cables soldered in one end and with the other drilled for the smallest size carbon electrode and a tightening screw. The ground connection is merely a heavy soldering lug soldered to the end of the other welding cable. In use, it is attached to the work with a "C" clamp.

Inasmuch as this is not a high-power welder you will not require a face mask, although gauntlets for the hands are sometimes desirable. The light of the arc is extremely harmful to the eyes, however, so you should use welding goggles with No. 8 lens, which cost from $1.25 to $2.00.

Welding electrodes of 3/16-inch carbon are standard for the MI Arc Welder. Use only the smallest, flux-coated metallic electrodes. Merely touching the carbon electrode to the work will generate enough heat to cause solder to run freely at once, while by raising the electrode from the work a small fraction of an inch an intensely hot arc will be created. Feeding small-size filler rod or wire into the arc will cause it to be fused instantly so as to weld parts of the work together. Inability to hold an arc will be caused by using electrodes too large in diameter. As mentioned at the beginning of this article, the welder may be used continuously without overheating.

What To Do About Parallax

[Continued from page 121]

If the camera is of the film pack type and is equipped with a ground glass focusing screen, these experiments will take only a few minutes. The folding-wire finders on most of these cameras get bent out of shape easily, so it is a good idea to check them occasionally by the target test as described.

If your particular view finder shows very bad discrepancies, it might be advisable to mask it off with thin strips of friction or adhesive tape, carefully placed so as to correct the field of view.

A valuable incidental feature of the target test is that it tells how far the eye must be kept from the view finder in order to see the photographic scene. Some people habitually bring the eye too close, others too far, and they are never certain as to how much picture territory they encompass.

In connection with the parallax problem, it might be mentioned that the reflecting type view finders supplied on most folding cameras above the "miniature" size suffer very little from the effect. This is due to the closeness of the finder lens to the actual camera lens, which permits the finder to intercept light rays only a small distance displaced from the rays that enter the camera.

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Fighting Water Famine

[*Continued from page* 69]

just [redacted] rapidly [redacted] possible, for filling underground reservoirs is not like pumping water into a tank. It must be done gradually. Nature's reservoirs are filled with sand and gravel, in which the water moves slowly, perhaps one to fifty feet a day. The new dams are to be merely tanks whence the water will be led downward by a set of giant wicks.

Gradually released from the dams, it will flow over porous gravels in the old stream beds, sinking as it does until it has disappeared into the subterranean basins below. Engineers tailored new bottoms to the riverbeds, inventing a system of joined concrete blocks, each a foot square, slightly spaced and hinged together so as to adjust itself readily to the stream bed. Fifteen miles of this flexible apron have been built. Along the sides, workmen shot cement under high pressure through guns, building up [redacted] concrete riverbank three inches thick. Then 4,000 acres of spreading grounds were established, where porous gravel, hungrily absorbing water, conducts it downward to storage.

Tunneling under the bed of an apparently dry river, engineers drove a horizontal well—a shaft from which extend many galleries. Water seeps in and is carried away in conduits. More than 20,000,000 gallons daily are wrung from this "dry" stream.

Engineers viewed with jealous eyes the 127,000,000 gallons daily pouring through the city's great outfall sewers—half again as much as the combined flow of the country's three largest rivers. Of this volume, 9,996 parts out of each 10,000 are water. The engineers begged permission to experiment.

Erecting [redacted] plant in one of the parks, they turned the raw sewage into tanks where it was scientifically treated. Great paddles broke up the suspended "sludge." Then yeasts and chemical reagents were added. Bacteria and microscopic fungi "digested" the organic material—literally burned it, by oxidation, to cinders. Chlorine and lime aided in the work of this giant stomach, which also produces valuable by-products. Gases evolved in chemical reactions provide fuel to turn the machines. The odorless solid remnant, dried and pressed into cakes, is sold as fertilizer.

Water entering the plant contained 7,000,000 bacteria per cubic centimeter. On leaving, it had but 100. Pure drinking water may contain ten times as many, yet comply with legal requirements. Chemists at the plant drink treated water and say it is purer than water from the ground. But the public would not drink reclaimed sewage, so the liquid is turned into spreading grounds, whence it filters through the earth to add its bit to the underground lakes.

A large quantity of the camphor used is made synthetically from turpentine.

Microscope Slides

[Continued from page 105]

form of jelly glass is satisfactory. Retain the tin caps so as to keep your reagents covered.

Pour the fixer into such a glass until nearly full, then put in the material to be fixed: for example, a tree bud such as we used for discussion in the May issue of MODERN MECHANIX. The length of time for fixation varies, but formol-acetic alcohol is very flexible and it is almost impossible to overfix with this reagent. "Overnight to twenty-four hours" is a frequent statement in the technique manuals, and may be regulated to suit one's personal time schedule.

Washing comes next and unless otherwise specified, this is to be done with tap water. A glass of water may be used, changed a number of times over the period of washing, which is the same length as that of fixing, the purpose being to rid the tissue of all excess fixer. If a water tap is available in the workroom, however, a much better method is to rig up a running water washer, as follows:

Select a wide-mouthed bottle of capacity from one pint to one quart. Bore the cork stopper with two holes for glass tubing, a long piece to reach almost to the bottom of the bottle, and a short piece which goes just through the cork. Hook up the long piece with rubber tubing to the faucet, and the short piece with rubber tubing which is for overflow and reaches to the sink.

[Continued on page 158]

Wet, Dry Bulb Thermometer

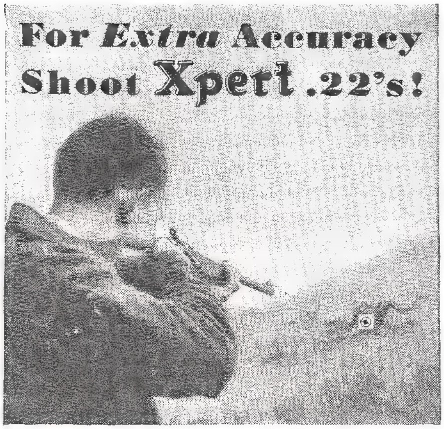
[Continued from page 87]

in a chemical supply house, or in some hardware stores. Using a bunsen burner, heat one end and shape it as shown in the photograph. The wick can be a corset string or any similar material.

Briefly, the operation of the thermometers is as follows: When the liquid around the end of the thermometer evaporates, the bulb is cooled, thereby causing a lowered reading. The rate of evaporation depends largely on the amount of moisture in the room.

The rate of evaporation controls the temperature of the wet bulb thermometer, thereby causing a difference in the readings of the two thermometers. If there is considerable moisture in the air, the rate of evaporation will be less than if the air is very dry. Therefore, in dry weather, the dry bulb reading may be 100 degrees, while the wet bulb reading will be 88 to 90 degrees. On damp days, the readings of the two thermometers may be almost the same, the wet bulb reading being but one or two degrees below the dry one.

Distilled water should be used in the tube to prevent deposit on the wick. The mineral content of tap water after several weeks of use may result in a substantial deposit on the wick, thereby reducing the accuracy of the reading.



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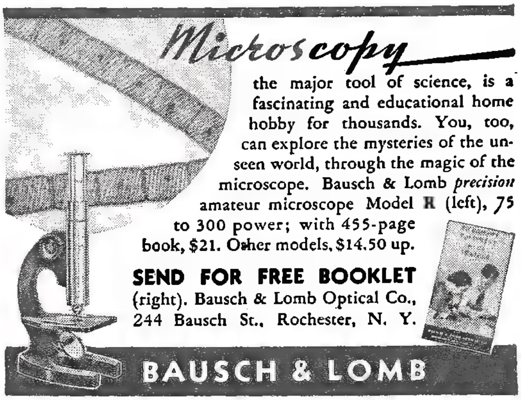

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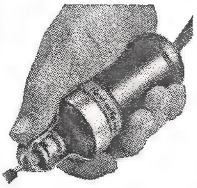

Tricks With Bottles

[*Continued from page* 134]

cork about the size of a marble. The cork is placed inside the bottle previous to your performance of the trick.

To perform, push one end of the rope into the neck of the bottle, then invert the bottle as shown in the picture, holding the rope in place so that it will not fall to the floor. The piece of cork will roll toward the neck, and a slight pull on the rope will cause the cork to enter the neck slightly and wedge between the glass and the rope. You can now release the rope and allow it to remain suspended from the bottle. Then grasp the free end of the rope and allow the bottle to hang. Swing it back and forth several times to make the trick look more effective. The audience is amazed because they cannot imagine what is causing the bottle to remain fastened so tightly to the rope. Pushing the rope slightly into the bottle will dislodge the cork and allow you to remove the rope. Hand it out to someone in the audience. The bottle is held by the neck in the left hand and while everyone is looking at the rope, tilt the bottle slightly and permit the cork to drop into your palm. Then hand the bottle out for examination and leave the piece of cork in your pocket.

"Mechanix Illustrated" In The Movies

[*Continued from page* 71]

starting actual "shooting." The full technical and creative facilities of the Vitaphone Studios, headed by Mr. Sam Sax, are being put behind the MECHANIX ILLUSTRATED pictures. Few plants in the motion picture industry are better fitted for this difficult work than the Vitaphone unit, which covers an area of several square blocks in Brooklyn, N. Y. Here are four huge sound stages, equivalent to Hollywood's best, with the very latest camera, lighting and processing equipment. The studios include one of the world's largest film laboratories, where the countless negatives of all Warner Brothers and First National feature pictures are printed and distributed to more than 16,000 theatres.

The new Vitaphone-MECHANIX ILLUSTRATED "shorts" are directed by Ira Genet, who has produced many popular and successful movies of this type. Look for them at your local theatre!

Thirty years ago coal supplied 89 per cent of the United States' fuel energy; now it supplies only 50 per cent.

Geese as well as aviators can lose their bearings in a fog, judging by reports of geese seen in Great Smoky Mountains National Park.

Spring Overhaul On The Boat

[*Continued from page* 102]

With the varnishing finished, turn attention to the painting, starting first with the uppermost part and working down because you are bound to drop some paint, and should this land on a freshly painted surface below where you are working there is a mess of both words and paint. The best instructions for painting are issued by the manufacturer of the paint that you are using and are generally printed on the can. Follow these to the letter! The manufacturer of the paint wants his product to show at its best and has had experts in this line write these instructions for him. Between coats, treat your brushes with the fact in mind that they have a long life before them if properly cared for. If you have to purchase them new be sure that they are good ones. Your paint salesman will advise you of the best types for the particular work you wish to do. In choosing your colors be sure that they do not clash. An examination of the boats around you will suggest quite a few good color schemes. Don't use blue paint for the decks just because you have a lot on hand. Buy some yellow and turn it to green, which will be much better on your eyes and your neighbor's disposition.

At all times have a rag soaked in turpentine ready for use so that if you smear two different

[*Continued on page* 161]

Master Finish

[*Continued from page* 111]

sufficiently good condition to support the new coats. Repainting over dirt and oil or grease spots will not only spoil the appearance of the new job, but may later result in peeling and checking. *Be sure that the surface is clean!* If the old paint is in bad condition, scrape or burn it off until a firm foundation for the new paint is secured. When old paint is burned off with a blowtorch, be sure to get the written permission of your fire insurance company. If the wood is mildewed, clean it with a pound of tri-sodium phosphate dissolved in fifteen gallons of water; then rinse the surface well with a hose.

On new surfaces go over all knots and shiny spots with a coat of shellac, which will prevent pitch in the wood from coming through the subsequent coats of paint. On both new surfaces, and old ones on which the wood has deteriorated until it soaks up paint like a sponge, the following is a good "priming" treatment that will assure a good foundation. Three *thin* coats of paint are used. Thin the first with equal parts of raw linseed oil and good turpentine (not turpentine substitutes, by any means, as they invariably cause trouble later). This priming coat will sink directly into the cells of the wood and seal them effectively to a considerable depth. Thin the second coat with raw linseed oil. For the third coat, apply the well-mixed paint, and brush it out well.

Keeping the paint well mixed is one of the secrets of good work. A wood paddle in the pail and occasional stirring is all that is necessary. When you open a fresh pail of paint, the ritual that has proven most effective is: pour off the clear oils that have gathered at the top, then vigorously stir the settled pigments until they are of an even, creamy, consistency. Pour back a little of the oils at a time, stirring meanwhile. Afterwards "box" the paint a half-dozen times by pouring it back and forth from one container to another. After you have finished painting, and the remainder is to be stored for some time, a good trick is to tap the lid well in place, then store it away *upside down.* This will seal any possible crack through which air might enter and cause the oils to oxidize or thicken.

New brushes for exterior painting should be soaked for a day beforehand in equal parts of pure turpentine and raw

[*Continued on page* 146]

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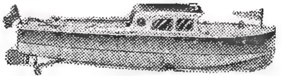

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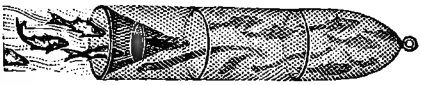

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At the same time intestinal waste poisons [redacted] often deposited in the blood stream, and may irritate the sensitive skin of your face and shoulders. Pimples break out.

Fortunately, there is a way to help keep these skin-irritating poisons out of your blood. Eat Fleischmann's Yeast, 3 cakes [redacted] day. The millions of tiny, *living* plants in each cake of this fresh food help to remove the wastes the natural way and clear the skin of pimples. Thousands of young people get results in [redacted] days or less. Act now. Get Fleischmann's Yeast and eat it faithfully. See how your skin clears up.

Master Finish

[*Continued from page* 145]

linseed oil. A 4-inch brush is suitable for general use, and it should be augmented by one two-inch wide for working in corners and painting window frames. A one-inch flat sash brush is also desirable. It is poor economy to purchase cheap brushes, which are liable to shed their bristles and make the work more difficult than it really is.

Outside painting is best done when the temperature is between 40 and 80 degrees F., with fair weather expected. Start on the north side of the house, as early as possible in the day, and work around the house so that the sunlight is always ahead. It is a mistake to wait until the first coat is absolutely "dry bone" before applying the next; wait only until one coat is hard, then apply the next so that there will be a secure bonding of the two paint films. Fill the brush only partly full and brush it out well so that every minute pore and crevice is reached.

Most interesting of the new devolopments in paint manufacture during recent years is that having to do with enamels, and of course the varnishes from which enamels are made. Formerly consisting of various fossilized plant gums (as in the case of shellac, an alcohol varnish which still finds wide use), these modern finishes are made up with synthetic gums and resins which are [redacted] product of the chemist's laboratory.

The pre-treatment of a surface to be enameled or to be varnished is quite the same, excepting that the transparent varnish may require an undercoating of stain. In either case, however, there is one fact that is of prime importance. *The finished work will be no smoother than the surface on which it is applied.* If this important point is remembered, half of the enameling or varnishing problem is solved. Particularly in the case of enamels, [redacted] glass-smooth surface having the appearance and feel of porcelain is desired. Modern enamels easily attain that objective and as a consequence they are ideal for brightening up the kitchen, bathroom, clothes closet; for application to practically any interior woodwork and furnishings. A damp cloth is all that is required for keeping such surfaces clean.

When the old finish appears to be in good condition and merely suffers from wear, it can be prepared for [redacted] new coat of enamel or varnish by the careful use of No. 00 sandpaper. Be sure to remove all scratches. If the old finish is badly worn, checked or marred, it should be entirely removed with either paint remover or by sanding. When the bare wood is revealed you may find that it has been stained; in this case, give it a thin coat of shellac so that the stain will be prevented from working up through the new finish.

When [redacted] new surface is to be varnished, the first operation is usually that of staining. Oil or water stain is not difficult to apply; the former is more suitable for soft woods and will not swell the grain of the wood. On the other hand [redacted] good water stain will give [redacted] richer appearance, and it is more permanent as it is less subject to fading. Before applying the latter, sponge the new wood with water, allow it to dry thoroughly, then sand it perfectly smooth. The stain should be tried first on a piece of scrap wood to determine the shade, and if desired it may be diluted with a little alcohol to secure greater penetration. In applying it to the work use a wide brush and quick, long strokes *with the grain.* Never go over the surface twice. If the surface is of open-grain wood, speed in applying is essential if you wish to avoid too deep a color. The appearance will be more uniform if you immediately go over the work with a clean cotton (not woolen) rag. After the wood is thoroughly dry it will probably require [redacted] light sanding; then dust it thoroughly and apply [redacted] sealing coat of thin shellac.

For that desired glass-smooth finish, open grain woods (such as walnut, oak, chestnut) should next have an application of paste filler. This must be thinned with turpentine or benzine so that it is of the right consistency to fill the open pores of the wood, as determined on a scrap piece. Use [redacted] somewhat stiff brush and work it well into the wood as if you were using a shaving brush. Almost immediately the filler will commence to set and then the surplus must be wiped off immediately with a clean cloth. This will be difficult if you wait too long. After the work has dried for at least thirty-six hours, smooth down the surface with fine sandpaper.

The ultimate smoothness of an enamel or varnish finish depends considerably on the type of brush that is used, and [redacted] brush that appears to be a bargain when examining the price ticket will be found anything but that when you examine the result of your decorating efforts. It is good economy to purchase [redacted] good quality soft fitch brush, one two and one-half inches wide for general work and one one and one-half inches wide for narrow surfaces.

Petroleum got its old [redacted] "Greek fire" after the Greeks burned [redacted] Scythian fleet by pouring oil on the [redacted] and igniting it.

The "2-3" Portable

[*Continued from page* 117]

The circuit of this receiver is not the least bit complicated. The first tube, the RK-42, is used as a regenerative detector and is sensitive and smooth in operation. The other "dual-tube," the RK-43 is used as two stages of audio frequency amplification, which provide more than sufficient volume for the earphones.

The earphone jack is mounted between condensers C2 and C3 on the front of the set, and is insulated from it by fibre washers in back and front.

Resistance coupling is used in the a.f. amplifier in order to cut down weight, as audio transformers weigh considerably more than the resistors and the fixed condensers.

Regeneration in the detector is controlled by a 140 mmf. variable condenser, C3. This throttle condenser method, as it is commonly termed, provides smooth control and is more economical than the potentiometer method, because it imposes no drain on the "B" batteries.

Variable antenna coupling is obtained through the use of a 35 mmf. variable condenser, C2, connected between the antenna and the grid side of the plug-in coil. This condenser must be insulated from the front of the cabinet by means of fibre or bakelite washers. Make sure the mounting stud does not touch the metal of the cabinet.

The main tuning condenser, C1, is mounted directly on the front of the box or carrying case. By mounting the plug-in coil directly behind the tuning condenser, short leads can be used. Plug-in coils are used because they take up less space than a band-switching assembly. For convenience in changing coils, there is a hole in the top of the case directly over the coil. A circular cover swings over the hole to keep out dust and to increase shielding.

As for performance, this little portable leaves nothing to be desired. Short-wave stations from

[*Continued on page* 148]

Method Of Making Pitchers

[*Continued from page* 118]

copper, and should be driven in to prevent leaking. The taller pitcher is made from a 5¾″ length of the same tubing. This, however, is driven in slightly at the bottom, and the top is expanded.

The spout, the throat of which reaches nearly the entire length of the pitcher, is formed over a length of ⅝″ round iron. The top of the pitcher is flared slightly all the way around. The bottom is soldered in, and the handle riveted on as before. The pieces are thoroughly cleaned with commercial nitric acid, washed, and highly polished. The finished pitchers may be chrome or silver plated if desired.

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The "2-3" Portable

[Continued from page 147]

all over the world have been received with excellent volume. The antenna used was a short piece of wire about 20 feet long. No ground was employed, although the use of one is strongly recommended, as it eliminates all possibility of body capacity effects. The ground wire, connected to a water hydrant, a drain pipe, or a metal stake driven in the earth, is hooked under any of the mounting screws of the metal cabinet.

While this receiver was designed for the shortwave listener, it is a good portable for the amateur. The only thing lacking for the "ham" is band-spread.

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- 1—small dial, National Type BM.
- 2—knobs for C2 and C3
- 1—S. P. S. T. toggle switch
- 1—pair earphones, with phone plug

Earth Bulge Causes Quakes

The enormous bulge in the earth that has its crest in the Himalaya mountains is responsible for the terrific earthquakes that sometimes rock interior Asia, Prof. D. Mushketov of the Leningrad Mining Institute states, after extensive expeditions in which thousands of observations were taken. The deep-seated forces pushed up the crust of the earth in this region as a man in bed pushes up the covers with his knees. Like the covers pulled over the knees, the thick blankets of rock are under tension. They give way from time to time, and that starts the earthquakes. Accurate measurements made by Professor Mushketov show that in the Pamir region the curvature of the earth is much in excess of the average curvature of the earth as a whole.

"The stinkwood" plant yields a fragrant distillate that may prove useful in perfumery.

Steel—Backbone Of World

[*Continued from page* 47]

with cold or molten pig iron, cold scrap, or any combination of these. Limestone is added as a scavenger. Floating on the molten metal as slag, it absorbs all impurities. Chromium, nickel, vanadium, manganese, or any other alloying elements may be added to the charge at will to produce the type of steel desired.

The charging is done by enormous mechanical arms, which pick up accurately measured containers of cold materials, insert them through automatic doors, and invert them to dump their contents. Molten metal is charged by pouring from a huge ladle into a portable spout.

If a housewife was to make a cake as accurately as steel is made, she would have to measure the ingredients by ten-thousandths of ounces, and single grains of sugar. She makes only a pound or two of cake; a typical open hearth furnace makes a 200-ton batch of steel at one heat. Her oven reaches a maximum of 500°F. Steel bubbles in an open hearth furnace at 3,000°.

There are now nearly a thousand varieties of alloyed steels, the ingredients of which are controlled within a thousandth of one per cent, yet prior to 1900 there was only carbon steel, with various percentages of carbon.

Henry Ford is credited with forcing the steel

[*Continued on page* 151]

Drive Next Year's Car Today

[*Continued from page* 78]

engine when, and if, the car capsizes. Many trucks and buses are equipped with this device. It, too, is very inexpensive.

In your special touring kit there should also be a new gadget known as a "lamp glove." With this handy device you can remove broken lamp bulbs without the danger of cutting your fingers. It also removes lamps that are not broken but which are likely to break when you apply pressure. One of these "gloves" should be in the kit with your spare bulbs. It takes up little room. It's part of tomorrow's car.

In the realm of the engine there are a lot of devices that will put any car years ahead Consider for a minute the situation in lubrication. With one of the oil clarifiers and motor cleaners it is possible to keep lubricant in such shape that one filling, plus necessary additions, will be good for 8,000 miles. These clarifiers do require more frequent cartridge replacement than do regular oil filters, but savings in oil more than offset this. Clarifiers follow the theory of many engineers that well used oil, if kept clean, is beneficial to the engine. Of course if you do not feel like accepting this admittedly unconventional theory you can at least treat yourself

[*Continued on page* 150]

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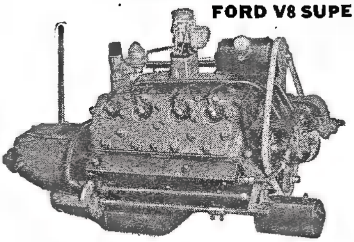

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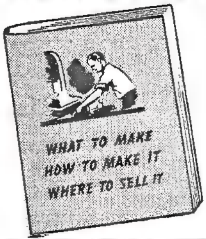

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Drive Next Year's Car Today

[*Continued from page* 149]

to one of the new filters which is conveniently cleaned by the simple process of rotating the cleaning blades.

And then when you want to drain off oil the ideal thing for the job is an automatic drainer. This is [redacted] special plug which replaces the engine's original drain plug. It is equipped with [redacted] remote control, so that by lifting the hood and inserting a key the owner of the car can drain off [redacted] portion or all of the oil anywhere he pleases. For removing crankcase diluent, which settles at the bottom, this is a handy proposition. It also helps the owner when he wishes to thin out the crankcase contents, or make it of [redacted] heavier average grade, by adding a quart or two of a different grade.

For the lower end of the radiator overflow pipe there is a new gadget to prevent spilling the cooling system's contents. That means less loss of anti-freeze in winter, and less chance of overheating in summer. Now that so many cars carry the battery under the hood it is a simple matter to install one of the new automatic water feeding systems for the cells. For the carburetor there are various mileage boosters, not to mention some attempts at supercharging. The latter is costly if desired in genuine form, but anything that helps the engine "breathe" improves what engineers call its "volumetric efficiency." Accessory stores carry adaptors so that if your present engine uses the older type, larger spark plugs you can enjoy greater ignition efficiency by installing 18 mm. plugs.

There appear to be endless ways of making your present car as modern as you please, and no end to opportunities in the direction of individuality. You can ride [redacted] dust storm with the new air conditioner and come out without [redacted] sneeze. You can gain more attention from those who follow by the simple process of replacing the conventional stoplight with [redacted] wig-wag lantern. A bumper jack in the tool kit saves all the annoyance of struggling to place the jack under the axle. Women motorists will appreciate the thrill of opening the glove compartment and discovering an illuminated vanity mirror on the inside of the door. And, incidentally, you can buy a keyless combination lock for this compartment.

You will enjoy an altimeter for traveling in the mountains, and it will help you in understanding why the car behaves the way it does when handicapped by a lower oxygen content. In your car of tomorrow, which we are offering you today, you do not have to guess at anything, much less gasoline mileage. There's [redacted] new fuel meter for the instrument panel. Any half dozen of the newer devices mentioned will go a long way toward making your present car [redacted] close cousin to the creations which automobile designers now have on their drawing boards. Why wait?

Steel—Backbone Of World

[*Continued from page* 149]

companies to produce alloys on a quantity basis. He wanted to make a light, durable car, one within the reach of every man. Carbon steels were too heavy when strong enough, and lacked the desired fatigue resistance.

Ford shopped among the big companies in 1907, but they refused to produce large quantities of the kind of steel he wanted. Republic Steel, then a young concern, agreed to meet his demands. With the new vanadium steel, Ford produced a car weighing 1,250 pounds, changed the auto from a plaything for the rich to cheap transportation for the masses.

While the open hearth furnace produces most of the alloy steels—and nearly all steels are alloys today—stainless and heat-resisting steels, and other of the highest quality alloys, are made in electric furnaces, the first of which was built in this country in 1906.

The electric furnace is a circular steel shell mounted on rockers, and resembling a huge tea kettle. It is brick lined, with a clay-lined spout for tapping, and doors for charging. Two enormous carbon electrodes project through the roof, and the current, arc-ing through the slag to the metal, produces an accurately controlled heat which may reach as high as 3,800°F. The metal being hotter under the electrodes than near the walls, the mass is kept in constant motion, so is thoroughly mixed and uniformly heated.

The typical electric furnace has a ten-ton capacity, and turns out three or four heats a day. The Bessemer process takes only 15 or 20 minutes, and a single converter can produce 2,800 tons a day. Open hearth furnaces produce up to 250 tons of steel at a heat, which requires 10 to 13 hours.

Unless steel is made into a large casting, such as a heavy machinery part, it is cast into ingot molds. When the metal has had time to solidify the molds are stripped from the hot ingots, which weigh from one to five tons. The ingots are kept at rolling temperature in the soaking pit, where they are soaked in heat at a uniform temperature of 2,200 degrees.

Usually the next operation is to roll the ingot into a bloom. Huge finger-like tongs pick an ingot from the soaking pit and carry it to the blooming mill, where it is kneaded and rolled between power-driven steel rolls, much as pie dough is rolled out by a cook, and for much the same reason—to improve its texture and change its shape.

If the bloom is to be made into rails, it passes through another set of rolls nine times, during which its cross section is reduced and its length increased, while it gradually takes on the familiar "T" shape. It then passes through another set of rolls five times, becoming more rail-shaped with each passage. Still white hot, it finally passes

[*Continued on page* 157]

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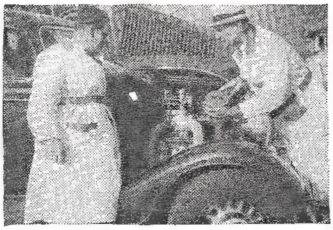

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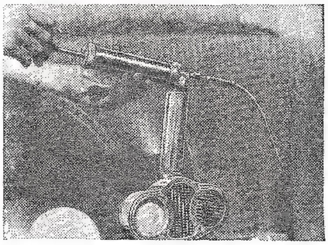
Compact Device Helps Motorists Check Gas



A newly developed automotive device enables a motorist to check the condition of the gasoline or oil being used by drawing off a sample of either into a glass tube, which is part of the device. A long flexible metal tube is inserted through the oil-filling hole in the crankcase or the gas tank opening and when the pump plunger on the device is pulled back, a sample of the oil or gasoline is sucked into the glass tube, as shown in the photograph above.

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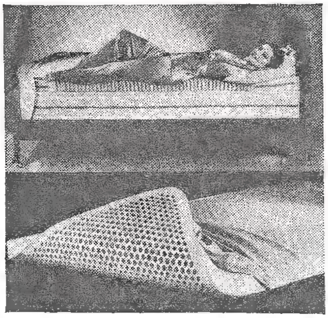
New Mattress Made of Foam Rubber



Weighing about half as much as an ordinary mattress of equal size, a newly developed "sleep-cushion" is composed of 85% air and 15% foam rubber (lower photo). The upper photo shows how the new type mattress shapes itself to the body contours of the sleeper, supporting every part of body in direct proportion to weight.

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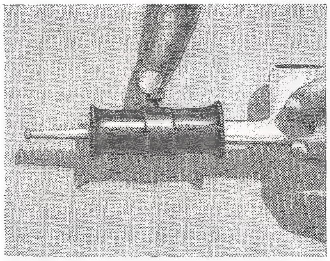
Pipe Holder Fastens to Auto Dashboard



For the motorist who smokes a pipe, a newly invented device enables him to keep the pipe safe and within reach on the dashboard when not in use. The device consists of a horizontal metal tube fitted with small springs inside, the springs being adjustable so that any size pipe stem can be held.

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Steel—Backbone Of World

[*Continued from page* 151]

through the finishing rolls, a rail 120 feet long, to be cut into 32 or 39-foot lengths.

Instead of rails, the bloom might become any one of the many structural shapes used in bridges and buildings. It might be rolled into billets for rods of various sizes, or into slabs, if its final form is to be sheets or strips.

Many of the rods are made into wire, by drawing them through a series of dies while cold, each hole being smaller than the rod passing through it. Cast iron and alloy steel rods are used as dies for coarse wire, diamonds for the finer wires. There are 160,000 uses for steel wire, including fencing, paper clips, hair pins, guitar strings, and hairsprings in watches. There are wire springs so small it takes 83,000 to make a pound, and a ton of them is worth $200,000. And there are heavy machinery springs that require a weight of 14,000 pounds to depress them one inch. Without springs we could have no watches, no internal combustion engines, no telephone bells or window shades.

The continuous strip mill, though developed within the past ten years, has revolutionized the production of flat-rolled steel. A white hot slab is fed into one end of the mill, passes through ten sets of rolls in a straight line, and emerges as a steel strip several hundred feet long, and any desired width up to [illegible] inches. Since each roll reduces the thickness and increases the length of the strip, each succeeding set of rolls must run faster, until the white hot steel is traveling 20 miles an hour when it emerges. Separate electric motors drive each set of rolls, and their timing must be precise to the thousandth of a second to take up the slack, and prevent the white hot strip from kinking and running wild.

If hot rolled sheets are being made, the strip is run onto a table and cut to the desired lengths. If the steel is to be cold rolled, it is coiled into enormous rolls.

The principal products of continuous mills are sheets for stamping and drawing auto body parts, and tinplate.

The cheapness and splendid appearance of the modern motor car is possible only because of recent developments in producing cold rolled steel sheets.

In 1910 an auto body had to be bent by hand around a wooden frame, then riveted, brazed or welded into place. And it took twenty coats of paint, priming, and varnish to cover up the rough surface of the steel.

Today body parts are stamped out cold in huge presses, the steel now being ductile enough to stand the stresses of such stamping. Cold rolling has given a surface that requires no priming or touching up, and can be covered with two coats

[*Continued on page* 158]

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc. This entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G.P.O.), Brooklyn, N. Y.

GENEROUS OFFER! Triangles from three countries, Afghanistan, Newfoundland Commemorative, Giant Map Stamp, United States $5.00 stamp, over fifty different others. Everything 10c to approval applicants. Tru-Value, Box M-1412, Hartford, Connecticut.

REVISED 1938 Stamp Annual Free:—Describes and Illustrates Albums, Supplies, United States, Coronations, British Colonials, Canadians, Foreign Stamps. This fifty-page catalogue Free. Gray Stamp Company, Dept. M.M., Toronto, Canada.

1897 GRANDE Comore Islands, Liberian Bongo Antelope, rare old genuine Baden, Turks Caicos, $5 U. S., British Colony Map Stamp, etc. Everything 3c with approvals. Viking, 1-MM Hanson Place, Brooklyn, N. Y.

DIAMOND Airpost Commemorative Issue Complete, Proletariat Portraits Complete, Dragon Stamp, with 117 additional, cataloging $3.00, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

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UNITED STATES—45 Different, Perforation Gauge, Hinges, Bargain Price List—all for 10c. Seidenberg, Baroda, Mich.

COSTA RICA Philatelic Sheet, ten cents. To approval applicants only. B. K. Stamp Co., Perryville, Maryland.

MIDGET MIXTURE—100 foreign stamps—Asia, Egypt, Europe, etc., 5¢. Guy Elsea, Bowling, Green, Ohio.

FREE!!! Two Coronation Sets. Postage 3c. Roberts, 312T Shearerbldg, Baycity, Michigan.

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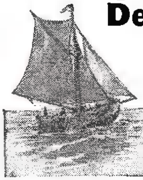

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Steel—Backbone Of World

[*Continued from page* 157]

of enamel. It is almost entirely a matter of the quality of steel that makes the cheapest car today a far better product than the most expensive car of 20 years ago.

So important has steel become in modern civilization that there are now 18,000 pounds in use for every person in the country—seven times as much as in 1900.

The house you live in may have a steel frame or was cut and put together with steel tools. You sleep in a bed with steel springs, and a steel alarm clock wakens you. You don clothes made on steel looms and eat breakfast cooked in steel utensils on a steel stove.

You ride to work in a steel auto, or on a steel trolley or subway train running on steel tracks. You work in a steel-supported building. You use steel tools, or your stenographer types your letters on a steel typewriter. You sign them with a fountain pen molded in steel.

The food on your dinner table has been cultivated with steel implements, milled with steel machinery, baked in steel ovens, preserved in steel cans or refrigerators. It was brought to you in steel cars over steel rails, in steel ships, or in steel trucks over steel-reinforced roads.

The magazine or book you read was printed on a steel press. The paper itself is made from wood, cut with steel tools, processed in steel machines.

There is scarcely a phase of your life today that is not touched, improved or made possible by steel. It is perhaps the most significant factor in twentieth century civilization. Steel is the backbone of the modern world.

Microscope Slides

[*Continued from page* 143]

A very slow and gentle stream is turned on and the tissue placed in the bottle.

Now label a series of glass jars and fill each with its proper reagent—30, 50, 70, 85 and 95% alcohols and pass the tissue through each of these in succession, 30% first; a two-hour stay in each. If more convenient to fit a time schedule, a longer stay does no harm. These alcohols perform two steps in technique—hardening and dehydrating—the gradual elimination of water, and its replacement by increasing strengths of alcohol. Dehydration is necessary since tissues would rot in water, and also to be able to pass into chemicals that will not mix (are not miscible) with water. Paraffin, xyol and balsam, all used at some stage in these procedures, will not mix with water.

Comes now this time to get rid of that last 5% of water remaining in the "pure" (95%) alcohol. The next step to come up is termed clearing and involves soaking the material in an oil to render it translucent and to permit passage into either paraffin for sectioning or balsam for mounting. Neither of these substances is miscible with alcohol, but xyol will clear and will mix with alcohol on the one hand and with either paraffin or balsam on the other; hence it is generally regarded as the ideal clearer. It will not tolerate even the smallest trace of water, however, and so two methods of passing the tissue into xyol are possible—either add something to the 95% alcohol which will take up the last trace of water, or put something into the xyol for this purpose.

For the simpler method 100% alcohol is prepared—termed "absolute alcohol." Get some blue crystals of copper sulphate and heat in a porcelain evaporating dish over [redacted] low flame until the water of crystalization is driven off, leaving a white powder. Add [redacted] spoonful of this to a bottle of 95% alcohol and shake. This form (anyhydrous) of copper sulphate has a high affinity for water and will take it out of the alcohol, the powder turning blue, like the original crystals. Add powder until it no longer turns blue and keep this alcohol in a glass-stoppered bottle, with the stopper lightly greased with vaseline to exclude water vapor from the atmosphere. Let the powder settle to the bottom and pour off the alcohol slowly, as needed.

The object being processed is now ready for sectioning by any of the methods described in the preceding installment. The most exact work would be done by using a hand microtome and the imbedding technique, in which case the tree bud or other object would be taken from xyol and bathed in the melted mixture of paraffin-vaseline for one hour, then placed in the well of the microtome, which is filled with the imbedding mixture, and sections cut when the whole is cold. The imbedding bath must be warm enough to keep the mixture melted, but no warmer and should not be too prolonged or it will "cook" and ruin the tissue.

Next month, in connection with making your own slide dryer, we are going to describe a number of devices that will be equally useful as [redacted] paraffin bath. For the present, try placing the imbedding mixture in a glass dish (e.g., a low Stender) together with the tissue, and lowering over this a gooseneck student reading lamp, adjusting distance between imbedding dish and electric bulb until that temperature is reached that will just keep the paraffin mixture melted.

The final installment in this series on microtecnique will tell how to stain your fixed and cut sections in the same way that professionals make their perfect slides, and how to mount and finish such [redacted] slide. Meanwhile, practice fixing and sectioning, and in order to see what your results are like up to this stage, stain a few of your best sections with tincture of iodine, diluted with ten volumes of 70% alcohol. Stain for one minute, wash off excess stain with fresh 70% alcohol, pass through 85, 95 and absolute alcohol, five minutes each, then into xyol for five minutes and mount in balsam. If the stain is not sufficiently intense to bring out any structural detail in the material, allow a longer time in the iodine stain.

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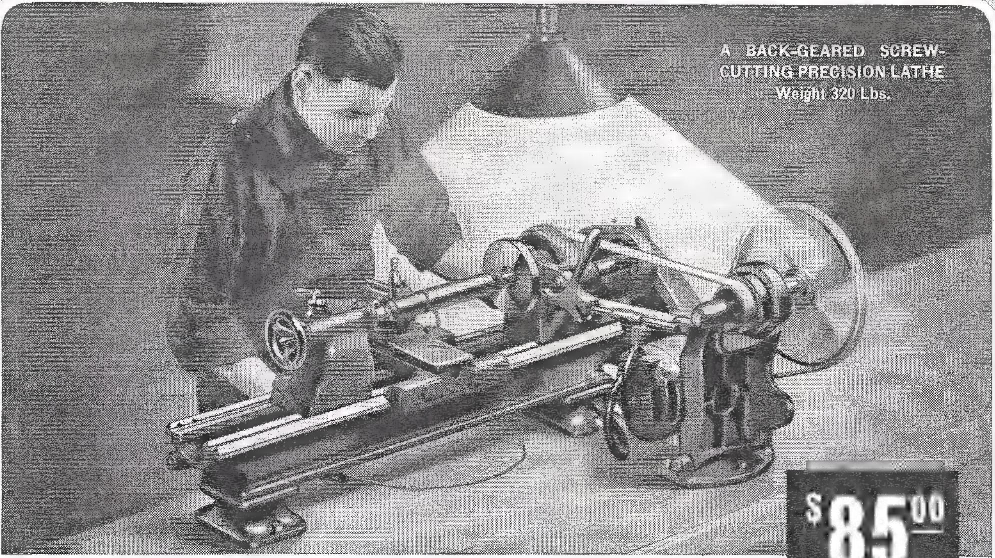

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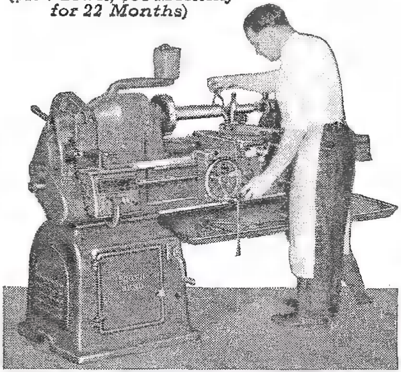

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SOUTH BEND *Precision* LATHES

Spring Overhaul On The Boat

[*Continued from page* 145]

colors together they can be wiped off at once. If any paint touches varnish, wipe it off at once. And DON'T paint around wet varnish, or varnish around wet paint. Sand each coat of paint after it is dry if you want a smooth job. Where two different colors separate it is well to cut a line with a race or scrieve knife so that the line will always be easy to follow. This will apply on the hull where the anti-fouling paint meets the topsides. Leave the anti-fouling until the very last, as you still have some work left on the bottom, which has been purposely laid aside until this time.

After all the bad places have been repaired on the bottom, the hull should be worked over with a wire brush to remove all the loose anti-fouling paint. The whole bottom up to the topsides should then be given a fresh coat of anti-fouling. Just before the boat is ready to go in the water, the second coat is applied so that it will still be wet when the boat is floated. Seams that have opened with the drying out of the hull due to the warm and windy weather should not be caulked if they are less than a sixteenth of an inch, as the wood will go back this much when the boat gets in the water. The wider seams should be caulked with caution and then only with a thin strand of lampwick. Before the last coat of anti-fouling paint is applied and the boat is ready to go over, putty all the open seams with a mixture of tallow and red lead, which will keep the water out until the planks have swelled, at which time it will easily squeeze out of the seam. Yellow laundry soap and white lead make another good putty for this work. The soap is melted and white lead added to it. Whiting and tallow make another good putty.

When it is launched have a can of dry oatmeal or sawdust on hand. If the hull is leaking badly and shows no sign of letting up as the wool swells, a handful of the meal should be placed as close to the leak as possible on the outside of the boat. The water working into the leak will carry some of the flakes with it and they will jam into the hole. With the swelling of the meal or sawdust the leak soon stops and a hauling-out is saved. Some leaks appear to originate at a spot which reason leads us to believe does not leak. The boat should be sponged and the trickle of water carefully followed. Some aluminum powder sprinkled on the water in the bottom of the boat soon will give us the direction of the flow and the leak may be traced to its source and stopped. Sometimes a little careful chinking of the leak from the inside will help a lot and last an entire season. The real cure for any leak on a boat is to fix it from the outside.

If the boat is a motorboat, the motor should be checked for alignment by uncoupling the shaft flanges to determine if the two faces are parallel. If they are not, the motor should be shimmed up

[*Continued on page* 162]

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Spring Overhaul On The Boat

[*Continued from page* 161]

on its bed until both flanges meet without any opening around their circumference. The joints of the fuel line should be gone over and checked for leaks, and if there is a strainer in the line (which there should be) it should be cleaned so that all of the last year's sediment will not get back to the motor. The stuffing box should be repacked if it shows any signs of a leak and the gland should be set up again no tighter than necessary to stop the flow of water. The exhaust line should be examined and all badly rusted parts scraped and the pipe given a coat of aluminum paint.

If you own a sailing craft the spars should have been scraped and varnished when the rest of the bright work was done. The wire rope rigging should be gone over for badly rusted spots and renewed if necessary. If the running rigging is worn at places and still looks good, it should be reversed or turned end for end so that the worn parts will not come in the same position as they did when last used. The sails should be spread out on the lawn to air and examined for bad places. Rips can be mended with baseball stitches or a patch. If the sail is dirty a good scrubbing on the dock with soap powder and a broom will work wonders. It should be rinsed overboard and if slightly mildewed it should be rinsed in a tub of clear water with some mild laundry bleach, and hung out in the bright sunlight to dry. Be sure that it is thoroughly dry before bending it on the boat.

A hopelessly mildewed sail that I saw last spring was revived and modernized by dyeing it blue; this is the only color that will hide mildew. If you are purchasing new sails be sure to have them mildew-proofed by your sailmaker before they are placed aboard the boat. When all the sails are bent and you are looking about for other things to do, shine the long neglected brass work and nickel. This can be kept bright for half a season by applying some metal lacquer in a thin coat. The galvanized work can be brightened up a bit by applying a coat of aluminum paint.

Last of all, look at the long neglected dock lines and mooring ropes. If they are in bad condition renew them, as they may fail at a critical moment and all the work put aboard the boat would be useless. With all the work finished you can at last loll on the deck satisfied that as the old sailors would say, "everything is ship-shape and Bristol fashion."

Traces of black, brown, and red color on the Egyptian pyramids have been studied by a British scientist, who concludes these are not traces of ancient paint on the pyramids, but are natural coloring derived from the stone itself.

Cigarettes gained popularity in the Crimean War when soldiers used cartridge paper to roll smokes.

Science Is King!

[*Continued from page* 139]

ticularly true since the world learned from Galileo the science of inductive thinking.

And a tremendous volume of progress has been achieved by the labors of men quite without academic background and education. One thinks immediately of the Wright brothers, who had a bicycle repair shop. The French Academy of Sciences and many other learned bodies bestowed all sorts of honor on them in later life. But when they started out on those experiments that astonished the world, their book-learning was exceedingly small. In "The Work, Wealth and Happiness of Mankind," H. G. Wells points out: "The activities of the gentlemen who launched natural philosophy upon the world needed to be supplemented by work of a coarser type before they could realize its vast potentialities. There were practical men, mostly millwrights and often with no education (Brindley could scarcely read and could write only with difficulty), who understood the present needs of the day and the practical difficulties in the way of overcoming them."

In a larger sense, however, all this discussion of who invented what comes down to a matter of almost legal quibbling. But it bears out the claim that everything in civilization today is the accumulated result of the work of thousands of minds, some of them working in obscure and forgotten channels.

I suppose the last place where such facts will be recognized is the school room. History continues to be a recitation of the acts and achievements of statesmen, soldiers, conquerors, many of them no better than gangsters. When the text books pay as much attention to Faraday and Oersted as they do now to Napoleon and Talleyrand, civilized thought will have advanced a bit further.

Glazed Traffic Lines

Terra-cotta is the latest material to be used for guide lines to separate streams of traffic. In the new Lincoln Tunnel under the Hudson River between New York and New Jersey a double line of white glazed terra-cotta blocks have solved the difficulty of painted marks, which wear off, and of concrete markers, which become discolored by traffic. The terra-cotta is white throughout its thickness, and remains white and shining regardless of wear.

Mineral wool is favored by many architects for insulating houses against heat and cold, but it is too bulky to be transported far by rail economically.

Television cameras, to be tried in England, are several times more sensitive than those previously used.

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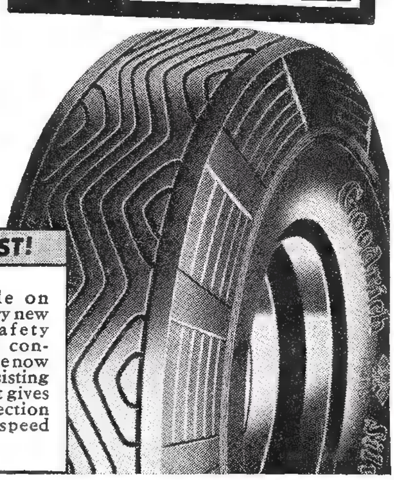

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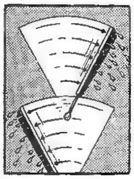
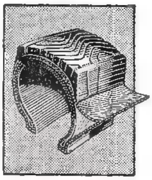

The never-ending spiral bars of the Life-Saver Tread act like a battery of windshield wipers—sweep the water right and left—force it out through the *deep* grooves . . . give the rubber a *dry* track to grip.


Don't gamble on blow-outs. Every new Goodrich Safety Silvertown is constructed with the now famous heat-resisting Golden Ply that gives you *real* protection against high-speed blow-outs.

The new Goodrich SAFETY Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ◆ GOLDEN PLY BLOW-OUT PROTECTION

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INVENTORS

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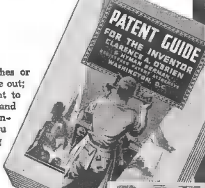

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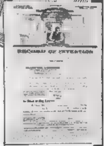

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FARMERS MECHANICS

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Your Ideas

TAKE STEPS NOW TO PROTECT YOUR RIGHTS

A FORMER First Assistant Commissioner of Patents once said, ". . . the shed mechanic, printer's devil, housewife and small town cobbler have yielded almost all the basic inventions of the last twenty-five years." Men in many different positions and trades have worked out worthwhile inventions: A portrait artist who studied electricity invented the telegraph; a poet who had mechanical leanings, made important improvements relating to the sewing machine; a man who specialized in teaching the deaf and dumb developed the telephone; a bank clerk whose hobby was amateur photography invented the hand camera; a farm boy who was studying radio distinguished himself for his inventions in television; a man who gained most of his education from correspondence schools has made important contributions to the efficiency of the modern radio. If you have a good invention, you should learn how to protect your rights to it.

READ ABOUT THIS Man

JUST a few years ago, during the depression, a man named Charles Bruce Darrow, of Philadelphia, Pa., found himself out of a job. He started tinkering and thinking, using the kitchen table for a workshop. In the course of a few months he had developed a new kind of parlor game. His friends tried the game, and liked it, so Darrow applied for a patent. The name of Darrow's game was "MONOPOLY"—and it is said that he has made a substantial fortune from it.

The procedure followed by Darrow was correct. First, develop your idea. Then make a record of it, show and explain it to friends whom you can trust. Then move to seek the protection of a U. S. Patent.

Our book "Patent Protection" explains all this procedure fully. It is interesting. It is instructive. And, if you have what may be a valuable invention, it is important to you.

IMPORTANT TO INVENTORS

Your invention may be simple—but it may be patentable. And many small inventions for the household, the office, or the shop have been very successful. But whether it is large or small, simple or complicated, there is one definite step you should take at once: You should make out a properly dated and witnessed disclosure of your invention. This evidence may be of great importance.

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To help you right at the start, we will send you a FREE Evidence of Invention form on which you may make out a full sketch and description of your invention, and then have it witnessed by one or more of your friends. This may be the very thing that spells the difference between success and failure.

Your Next [illegible]

The rest of the procedure is simple enough—but it is definite, and needs explaining. Consequently, we want you to read our big and interesting FREE book, "Patent Protection"—48 pages crammed with facts and illustrations. Patent procedure explained. Stories of interesting inventions. Facts about foreign patents, trademarks, etc., and 105 mechanical movements—many of which are helpful in developing inventions.

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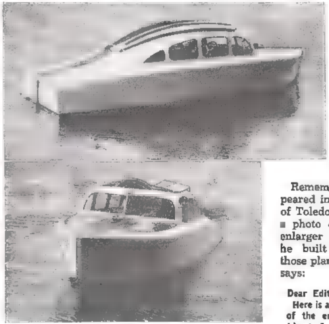
Chips from the Editor's Workbench



Built by Lloyd Spriggle, this trim streamlined motorboat is certain [illegible] win the admiration of all boating enthusiasts.

IT WILL take you longer to read this issue of MECHANIX ILLUSTRATED than previous issues of your old friend "Modern Mechanix," for the simple reason that we have added 16 solid pages to the editorial section! I [illegible] sure that you will like the many extra articles, the descriptions of new ideas and inventions, the big pictures, and the enlarged drawings of construction projects. True to its name, MECHANIX ILLUSTRATED will emphasize *illustrations* of *mechanical* developments; it will publish live, human-interest photographs that you will find interesting, instructive and helpful.

Workshop fans will, I [illegible] sure, be pleased to know that more space will also be given to the ever-popular "Workbench" Department. Every month [illegible] receive hundreds of fine letters and pictures showing shop projects made from our plans and blueprints and we intend to publish as many as we can, to show how capable and skillful MECHANIX ILLUSTRATED readers really are. Send in your letters and photos for judging in next month's Workbench contest.

***

First on the line this month is Lloyd Spriggle, of Bay City, Wis., who was awarded a $5 prize for his photos and letter describing his home-built boat. He writes:

> Dear Editor:
>
> I [illegible] enclosing prints of my home-built boat. The rumble seat is enclosed by [illegible] cover which has sliding doors. When closed, the doors drop flush with the top creating [illegible] perfectly streamlined unit, which is strong enough to walk on.
>
> Lloyd Spriggle.

You didn't supply any information about speed, construction time, etc., Lloyd, but I just had to award you a prize because of the boat's appearance. It sure is a beauty.

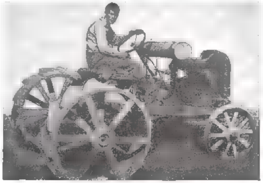
***

Remember the photo enlarger plans that appeared in our March issue? Well, C. E. Prange, of Toledo, Ohio, scored [illegible] $3 prize by sending in [illegible] photo of the enlarger that he built from those plans. He says:

> Dear Editor:
>
> Here is a photo of the enlarger that I constructed from the plans in your March issue. It gives excellent results.
>
> Your amateur photography section is great and I have received some good ideas from it.
>
> C. E Prange.

C. E. Prange built this photo enlarger from plans in our March, 1938 issue.

Thanks for the kind words, Prange. I'll do my best to keep you amateur photo fans supplied with practical suggestions and how-to-build articles. Incidentally, the enlarger plans are reprinted in our new PHOTOGRAPHY HANDBOOK, now on sale at camera stores and on newsstands everywhere.



Johnnie Bray and [illegible] home-built "five mule-power" tractor.

***

I'm not [illegible] farmer, but I can tell a good tractor when I see one, and that's why I sent a $3 award to Johnnie Bray, of Pinson, Tenn., whose letter reads:

> Dear Editor:
>
> The enclosed photo shows a tractor built by my brother and me. It features a four-cylinder engine and differential which were salvaged from old autos. The machine does the work of five mules and has six forward speeds and one reverse. The total construction cost [illegible] only $20, as we used parts from seven old autos and one tractor to build it.
>
> Johnnie Bray.

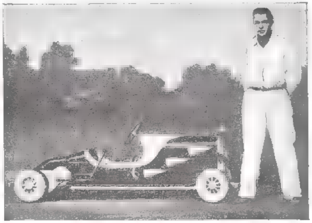
I wish I could invest $20 as profitably as you apparently have done, Johnnie!

***

You fellows who itch to get behind the steering wheel of [illegible] little four-wheeled "put-putter" will be interested in the letter I received from William Graham, of Hazel Park, Mich., who was also awarded a $3 prize. He says:

> Dear Editor:
>
> Enclosed is [illegible] photo of the midget [illegible] which I built for my [illegible] from your plans. It is powered by a 1½-horsepower lawn [illegible] engine hooked up with a chain and V-belt drive. For safe operation I geared the car so that it will [illegible] 10 m.p.h.
>
> William Graham.

I bet young Graham gets as much thrill when going 10 m.p.h. in his racer as some of you older fellows do when you eat up the road at 70 or even [illegible] m.p.h. Take it easy, fellows, or "life may end at 40!"



Harold Huntley sent in this photo of [illegible] [illegible] built by [illegible] friend.

Capable of going 40 m.p.h., this tiny racer was built by Froilan de los Santos, in far away Manila, P. I.

William Graham built this midget car for his son. Lucky boy!

***

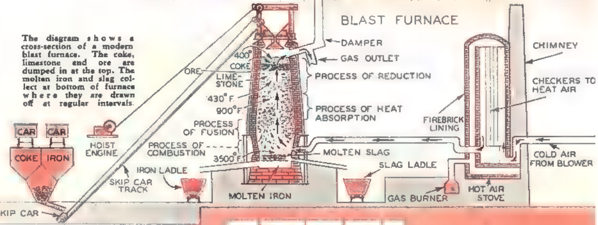
From the far away Philippine Islands I received a letter from another midget-racer enthusiast, Froilan de los Santos, who [illegible] also winner of a $3 award. His letter reads:

> Dear Editor:
>
> I am a constant reader of your magazine. It is the real thing when it comes to dishing out information on mechanical projects. The enclosed photo shows a midget racer which I constructed with the help of your information.
>
> The car is powered by a motorcycle engine and goes 40 m.p.h. at full gun. With the exception of the engine, wheels and headlights, everything is home-built, even to the small steering wheel.
>
> Froilan de los Santos.

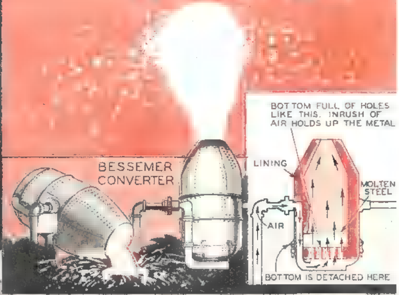
[*Continued on page* 16]

STEEL—Backbone of the Modern World

by Robert W. Gordon

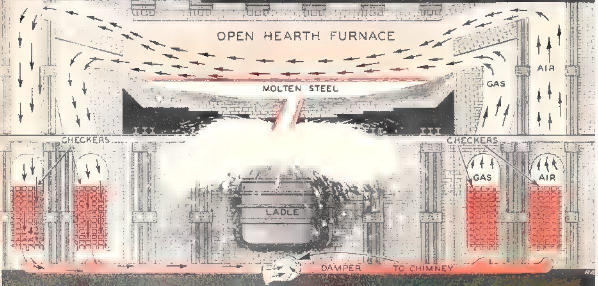

BLAST FURNACE
DAMPER
GAS OUTLET
PROCESS OF REDUCTION
PROCESS OF HEAT ABSORPTION
CHIMNEY
CHECKERS TO HEAT AIR
FIREBRICK LINING
400°
COKE
ORE
LIME-STONE
430° F.
900° F.
PROCESS OF FUSION
PROCESS OF COMBUSTION
3500° F.
MOLTEN SLAG
SLAG LADLE
COLD AIR FROM BLOWER
CAR
CAR
COKE
IRON
HOIST ENGINE
IRON LADLE
SKIP CAR TRACK
MOLTEN IRON
GAS BURNER
HOT AIR STOVE
KIP CAR

The diagram shows a cross-section of a modern blast furnace. The coke, limestone and ore are dumped in at the top. The molten iron and slag collect at bottom of furnace where they are drawn off at regular intervals.


BESSEMER CONVERTER
BOTTOM FULL OF HOLES LIKE THIS. INRUSH OF AIR HOLDS UP THE METAL
LINING
MOLTEN STEEL
AIR
BOTTOM IS DETACHED HERE

[illegible] right [illegible] shown a cross-section of a [illegible] converter. It consists of a huge, pear-shaped [illegible] pot, [illegible] with [illegible] ing brick. In use, [illegible] is tilted on its side and filled with molten iron. Carbon and manganese are added to make the steel hard and elastic. When the converter is returned to an upright position, air is forced into the mixture from the bottom. [illegible] fiery liquid is boiled for about twenty minutes. [illegible] iron [illegible] manganese are added. [illegible] lling period and [illegible] white hot steel is poured [illegible] ladle.

Below — Ope[illegible] hearth furnaces [illegible] per cent of the [illegible] in [illegible] United States. Molten iron and [illegible] materials [illegible] brick lined [illegible] and gas from a [illegible] oven [illegible] over [illegible] molten [illegible] drawn off from furnace [illegible]


OPEN HEARTH FURNACE
AIR
GAS
MOLTEN STEEL
CHECKERS
CHECKERS
GAS
AIR
LADLE
DAMPER
TO CHIMNEY

A silhouette of a large steel mill. Bessemer converters emit tongues of fire which can be seen for miles [illegible] night. The color gradually changes from red to [illegible] yellowish white.

Left—Blast furnaces and ore docks at Cleveland, O. The blast furnaces [illegible] [illegible] the left and right. The round structures between are stoves which heat the air for the blast.

—*Photos Courtesy Republic Steel Corporation*

A WORLD without steel—try to imagine it! Without steel, the whole physical structure of the modern world would collapse. Lacking this one all-important substance, the civilization we know would cease to exist. There was, of course, civilization long before the discovery of steel, but it was vastly different from ours; so different that it requires an effort of the will to picture [illegible] world without steel.

Without steel—

There would be [illegible] buildings higher than walk-up distance; [illegible] airplanes, [illegible] automobiles, no modern railways or fast steamships.

Without steel—

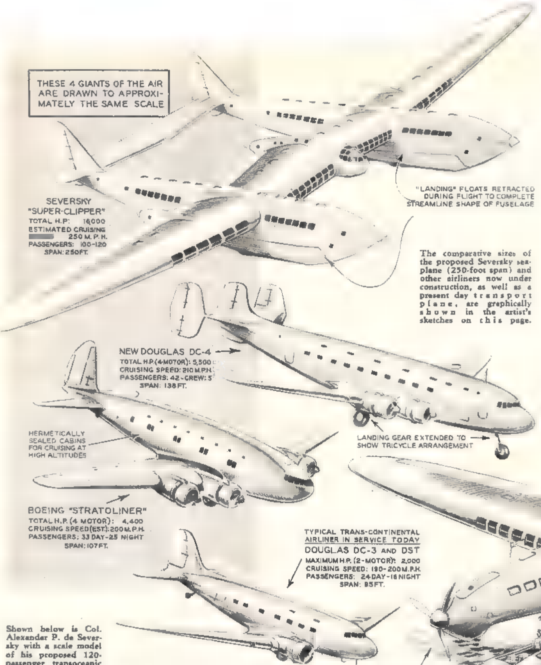
Foodstuffs would be largely limited to what could be grown locally, and the threat of famine would be ever present. The horse and the sail would still be the principal means of transportation.

Without steel—

There would be no modern factories, industry, cutting tools, or power machines. Countless features of the twentieth century world would be non-existant. The United States would be back in the era of the horse and buggy.

The changes wrought by steel have been

NEW GIANTS OF THE AIR

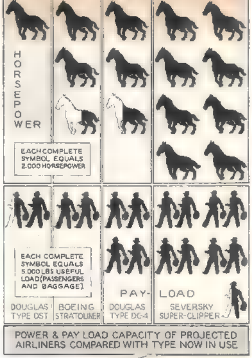

THESE 4 GIANTS OF THE AIR ARE DRAWN TO APPROXIMATELY THE SAME SCALE
SEVERSKY "SUPER-CLIPPER"
TOTAL H.P.: 16000
ESTIMATED CRUISING 250 M.P.H.
PASSENGERS: 100-120
SPAN: 250FT.
"LANDING" FLOATS RETRACTED DURING FLIGHT TO COMPLETE STREAMLINE SHAPE OF FUSELAGE
NEW DOUGLAS DC-4
TOTAL H.P.(4-MOTOR): 5,500
CRUISING SPEED: 210 M.P.H.
PASSENGERS: 42-CREW: 5
SPAN: 138 FT.
HERMETICALLY SEALED CABINS FOR CRUISING AT HIGH ALTITUDES
LANDING GEAR EXTENDED TO SHOW TRICYCLE ARRANGEMENT
BOEING "STRATOLINER"
TOTAL H.P. (4 MOTOR): 4,400
CRUISING SPEED(EST.): 200 M.P.H.
PASSENGERS: 33 DAY-25 NIGHT
SPAN: 107 FT.
TYPICAL TRANS-CONTINENTAL AIRLINER IN SERVICE TODAY
DOUGLAS DC-3 AND DST
MAXIMUM H.P. (2-MOTOR): 2,000
CRUISING SPEED: 190-200 M.P.H.
PASSENGERS: 24 DAY-16 NIGHT
SPAN: 85 FT.

The comparative sizes of the proposed Seversky seaplane (250-foot span) and other airliners now under construction, as well as a present day transport plane, are graphically shown in the artist's sketches on this page.

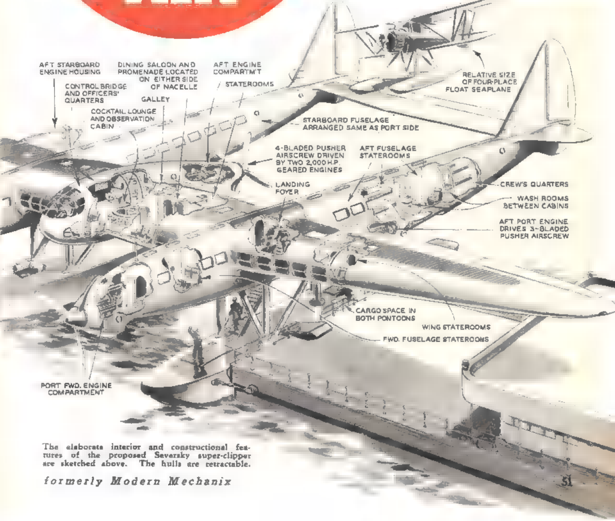
Shown below is Col. Alexander P. de Seversky with a scale model of his proposed 120-passenger transoceanic twin-hulled flying boat.

PLANS for a super-clipper seaplane capable of carrying 120 passengers at 250 m.p.h. for about 5,000 miles non-stop have been submitted to Pan American Airways by the Seversky Aircraft Corporation. The proposed air giant, with its wingspan of 250 feet, would dwarf the huge Boeing Stratoliner and Douglas DC-4 transport planes which are already under construction. (See accompanying sketches.)

The novel chart at the right provides a visual comparison of the power and pay load capacity of the projected and present day airliners. The Seversky plane, a giant among giants, will be capable of flying from New York to London in 14 hours.



POWER & PAY LOAD CAPACITY OF PROJECTED AIRLINERS COMPARED WITH TYPE NOW IN USE


AFT STARBOARD ENGINE HOUSING
DINING SALOON AND PROMENADE LOCATED ON EITHER SIDE OF NACELLE
AFT ENGINE COMPARTM'T
STATEROOMS
CONTROL BRIDGE AND OFFICERS' QUARTERS
GALLEY
COCKTAIL LOUNGE AND OBSERVATION CABIN
RELATIVE SIZE OF FOUR-PLACE FLOAT SEAPLANE
STARBOARD FUSELAGE ARRANGED SAME AS PORT SIDE
4-BLADED PUSHER AIRSCREW DRIVEN BY TWO 2,000 H.P. GEARED ENGINES
AFT FUSELAGE STATEROOMS
LANDING FOYER
CREW'S QUARTERS
WASH ROOMS BETWEEN CABINS
AFT PORT ENGINE DRIVES 3-BLADED PUSHER AIRSCREW
LARGE 3 BLADED TRACTOR AIRSCREWS EACH DRIVEN BY TWO 2,000 H.P. ENGINES
CARGO SPACE IN BOTH PONTOONS
WING STATEROOMS
FWD. FUSELAGE STATEROOMS
PORT FWD. ENGINE COMPARTMENT

The elaborate interior and constructional features of the proposed Seversky super-clipper are sketched above. The hulls are retractable.

'Mechanix Illustrated' In The MOVIES

[redacted] In [redacted] Wi[redacted] Be [redacted]

These pictures [redacted] representative of the effort and facilities put behind Vitaphone pictures. Above: A railroad sequence being "shot" on location. Below: "Hollywood-in-Brooklyn"; one corner of a huge sound stage in the Vitaphone studio in New York, where more than a hundred "shorts" are produced every year.

Above: Sam Sax, [redacted] of Warner Brothers' Vitaphone Studio, Brooklyn, N. Y., under whose supervision the MECHANIX ILLUSTRATED films are being made.

The two pictures on the left show Vitaphone camera [redacted] on the job. Top: filming the permanent model railroad built [redacted] by the New York Society of Model Engineers. Left: The color [redacted] records a wool dyeing operation in a factory. Setting up a heavy camera and a battery of powerful lights sometimes takes hours, while the actual shooting [redacted] take only a few minutes.

Don't miss first Vitaphone-MECHANIX ILLUSTRATED film! Mail us the convenient coupon below or write [redacted] a postcard if you do not want to cut your copy of the magazine. No obligation [redacted] your part, of course.

SOMETHING new and unusual in movie "shorts" will be offered to the public when the first of [redacted] series of Vitaphone-MECHANIX ILLUSTRATED films is released soon to theatres throughout the country. Made in full natural color by Warner Brothers' Vitaphone Studio in collaboration with the editors of this magazine, these absorbingly interesting movies will take audiences into science's laboratories and industry's factories, and will show for the first time how many of the marvels of our modern civilization are conceived and produced.

The films will run about ten minutes and each will deal with four specially chosen topics. However, months of preliminary investigation and preparation have been put into them. Warner Brothers production experts and cameramen, accompanied by members of the MECHANIX ILLUSTRATED editorial staff, visited many locations in their quest for colorful, human-interest material, and spent many hours on research before

[Continued on page 144]

Editor, MECHANIX ILLUSTRATED
1501 Broadway,
New York, N. Y.

I want to see the first of the Vitaphone-MECHANIX ILLUSTRATED Shorts. Please [redacted] me know when my local theatre .... (please fill in its name) will show it.

Name ....

Address ....

City

State

Drive Next Year's Car Today

by Frederick C. Russell

Ingenious new accessories will put your [illegible] a year ahead in comfort, convenience and safety.

Blowouts or bumps mean nothing to a [illegible] when it is equipped with a hydraulic steering stabilizer. This device takes control of the wheel in an emergency and prevents the car from [illegible]g its true course on the highway. Right—The stabilizer fastened in place.

WHETHER your car is [illegible] sparkling 1938 model or something which you are obliged to drive another year, it has never been easier to have a taste of tomorrow's motoring—now. The idea is suggested by the offering of an unusual number of ingenious and practical accessories. These new gadgets banish some of the ancient fears in driving, shorten the time required to keep the car up to par, and step up performance in a number of ways.

Do you drive in constant fear of a blowout? Are you annoyed by the penalty for forgetting to add water to the battery? Do you feel that the engine should give better performance, and would you care to try supercharging? Are you still changing engine oil every thousand miles? Do you envy those who are enjoying many new conveniences which you assume are available only on new cars? If so, step right up to the accessory counter and take your pick. Your 1939 car is ready!

Automotive engineers are looking over the present automobile with a view to seeing what new uses they can find for principles already employed. It was this policy that helped in the creation of a device that takes the hazard out of blowouts. If hydraulic shock absorbers control spring action, why not use [illegible] special shock absorber [illegible] the steering tierod? Why wouldn't this device effectively check the tierod's movement, in event of [illegible] front tire blowout, and prevent the steering wheel from snapping out of the driver's hand? When an automotive engineer asks "why?" he generally ends by providing the answer.

So [illegible] four-star accessory is born. With this large hydraulic hand on the car it is possible to strike a railroad tie with one of the front wheels while the car is traveling sixty miles [illegible] hour—and live happily ever after, even if the driver takes his hands from the wheel! No one wants to try that stunt, but the steering stabilizer is built to give that much margin of protection. Whether the car's stability is endangered by road obstruction or by tire collapse it continues in a straight-ahead direction unless the driver finds it necessary to steer to the right or left. Tomorrow's car will have this protection, but you can have it today.

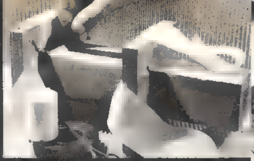
This device provides air conditioning for the car. Using the cowl ventilator as an intake, it purifies, warms and circulates air in the car. Tests have shown that this devi[illegible] [illegible] particularly helpful when the outside air [illegible] very dusty.

Imagine driving up to your garage, touching a button on the dash and having the doors [illegible] automatically and close when the [illegible] is inside. You [illegible] have this magic feature now. Why wait for it [illegible] become standard equipment?

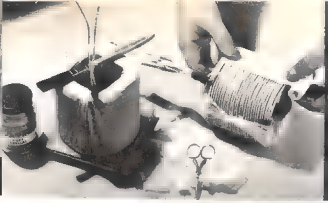
Solving the problem in a somewhat different way is the special inner wheel which serves to prevent that dangerous drop which occurs when a tire blows. The inner wheel takes over the job of supporting its end of the car until the driver has [illegible] chance to slow down and stop. Instead of dropping the dangerous distance to the rim the troublesome wheel drops only an inch or so to the edge of the safety inner wheel. Even though flat as a pancake the tire cannot offer that terrific resistance which usually is sufficient to throw [illegible] car out of control.

With either or both of these devices on the car, and with those special inner tubes which [illegible] being offered by major rubber companies, the fear of sudden tire collapse is definitely out of the picture for any motorist who wants his future motoring today. These safety inner tubes do away with the annoyance as well as danger from punctures. There is no particular magic about it. The thick center section of such [illegible] tube is turned

A total of twelve [illegible] of [illegible] both coils. [illegible] mary uses six pounds of No. 12 single cotton covered enamel, and the secondary six pounds of No. 10 wire [illegible] same type.

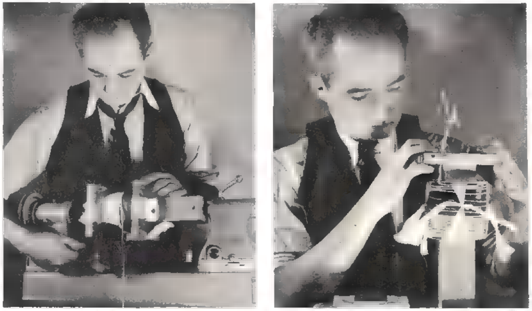


Several thicknesses of paper are held to the core with a piece of friction tape. Note strips of gauze, which facilitate removal of the core.

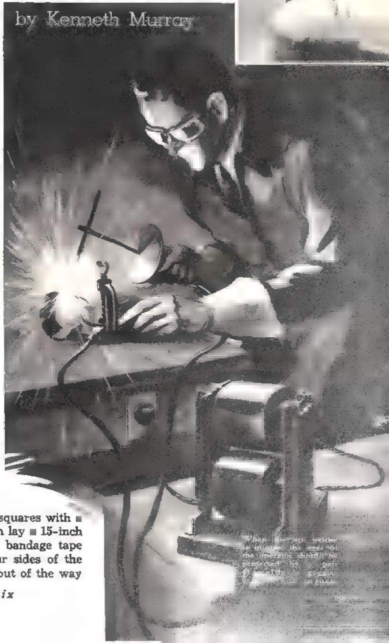


[illegible] the coil [illegible] cotton. The outside of [illegible] is coated with [illegible] shellac. [illegible] from each end of the secondary are [illegible] to [illegible] heavy [illegible] cables.

The "Mechanix Illustrated" ARC WELDER



Left—Tap each layer of wire neatly in place with a rubber or wood mallet. Right—By tapping the end of the tapered wood core [redacted] [redacted] hard surface, [redacted]il will slide off easily. Ends of [redacted] strips [redacted] tied to hold windings intact.



by Kenneth Murray

When [illegible] welder [illegible] the eyes of the operator should be protected by [illegible] pair [illegible] goggles [illegible]

FROM [redacted] examination of the design of the MI Arc Welder you will [redacted] that its principal features are simplicity of construction and low cost, but you will have to hold the electrode in your hand and give it an actual trial in order to realize the amount of sizzling, crackling heat it will generate.

The cost of building a welding transformer is in close ratio to the amount of current it will deliver without overheating. For example, you would need about 36 pounds of wire for [redacted] rated at 2,500 watts, and only 12 pounds of wire for one of one-third that capacity. When the former is used for light work, [redacted] reactance coil is needed to reduce the amount of current. Having in mind the needs of the man in the home workshop, the [redacted] I Arc Welder [redacted] designed exclusively for light work. It consumes less than 1,000 watts and therefore can be plugged into almost any 110-volt a.c. socket. It does not require the further expense of an auxiliary reactance coil. In addition to doing light welding, it is excellent for quickly soldering large work. The voltage is low so that even a child cannot receive the slightest shock. Finally, unlike outfits of larger capacity, it may be used continuously without overheating; ordinarily it will barely become warm.

For the primary and secondary coils of the transformer you will need a full 6 pounds each of No. 10 and No. 12 S. C. E. (single cotton enamel) magnet wire. The primary coil consists of 300 turns of the No. 12 wire and when in place over the iron core of the transformer it is connected directly to the 110-volt, 60-cycle alternating current line. The secondary coil consists of three coils of [redacted] turns each of No. 10 wire, which are wound [redacted] over the other and the ends of each then connected in parallel. This delivers the heavy current necessary for welding.

The winding form consists of a 12-inch length of wood that is 2¼ inches square. Taper it slightly towards one end, [redacted] that the finished coils can be slipped off easily. Then sand it smooth and apply a coating or two of wax. In order to confine the coils to a width of [redacted] inches you will need two 5-x5-inch squares of wood, one of which is screwed to the larger end of the form. Cut [redacted] 2¼-inch square hole in the center of the other and slip it over the form so that it is 4 inches from the first, then wedge or screw it tightly in place. Cover that part of the form between the squares with [redacted] thickness of waxed paper, then lay [redacted] 15-inch length of 2-inch cotton gauze bandage tape lengthwise of each of the four sides of the form. The ends can be held out of the way

USES FOR "WATER GLASS"

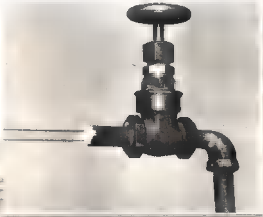
by

Raymond B. Wailes

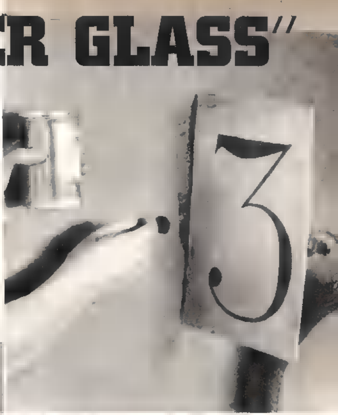
Sodium silicate solution has many common uses, several of which are shown in these photographs.

Diluted with three parts of water and applied with [illegible] wide brush for speed (above), water glass solution can be used to waterproof cement walls. Several coats should [illegible] applied, allowing enough time between coats for the solution [illegible] dry thoroughly.

A half-teaspoonful of water glass added [illegible] the water in laundry tubs will increase the amount of suds and soften water, effecting [illegible] saving in soap (above).



Glass tubes can be cemented in metal pipes (above) by using a cement made of water glass and whiting. If a cement [illegible] resistant to acid is desired, prepare [illegible] mixture of water glass, glycerine and litharge and apply profusely at joint where pipe meets glass.



The adhesive quality of water glass is shown in the photo above. The cardboard flap was coated with water glass and held against the building where it stuck immediately. The solution fireproofs materials somewhat. Apply it to amateur stage scenery.

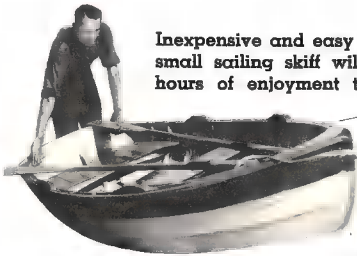
[illegible] cement made of water glass and whiting is excellent for repairing cracked ceramics (above). Water glass alone can be used to unite shattered glass objects.

Many grease [illegible] with ordinary cleaners can be removed by [illegible] water glass to the spot and [illegible] with a clean rag [illegible]

Applied with [illegible] broom (above), [illegible] dilute solution of water glass and three parts of water makes [illegible] ideal treatment for cellar workshop floors, eliminating the carrying of concrete-dust footprints to other parts of the building. The solution can also be applied just as effectively with [illegible] small stiff brush.

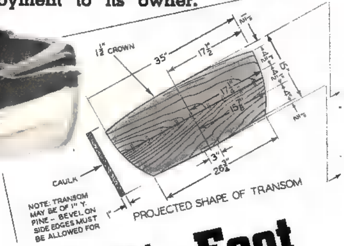
When it is desired to fasten glass to metal, make [illegible] paper gasket and place it between the glass and metal, using water glass as a cement on both sides of the gasket, as shown above. Apply the water glass on the gasket evenly with a small brush.

[illegible] without [illegible] water glass can be used [illegible] cement rubber matting to an automobile running [illegible]



This photograph of *Patty* just before launching shows clearly her trim lines. Her light weight makes it easy [illegible] put her in or take her out of the water when the sail is over.

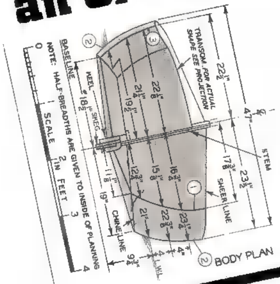
Inexpensive and easy to build, this small sailing skiff will give many hours of enjoyment to its owner.


1½" CROWN
35"
17¾"
1½"
4½"
4½"
4"
15"
17⅛"
15⅞"
3"
26¾"
CAULK
1"
NOTE: TRANSOM MAY BE OF 1" Y. PINE – BEVEL ON SIDE EDGES MUST BE ALLOWED FOR

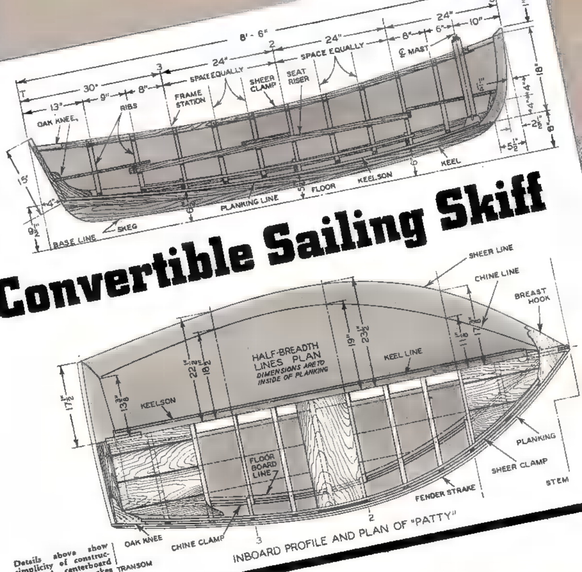
PROJECTED SHAPE OF TRANSOM

Building "PATTY" — an 8½-Foot Convertible Sailing Skiff

by J. Julius Fanta


BASE LINE
NOTE: HALF-BREADTHS ARE GIVEN TO INSIDE OF PLANKING
SCALE IN FEET
0
1
2
3
4
KEEL
18½"
SKEG
19½"
21¼"
22⅛"
22½"
TRANSOM. FOR ACTUAL SHAPE SEE PROJECTION
47"
STEM
17⅞"
23¾"
SHEER LINE
11⅛"
12¾"
15⅞"
16¾"
19"
CHINE LINE
21"
22⅛"
23¼"
9¾"
4"
4"
L.W.L.
①
②
③

BODY PLAN


8'-6"
24"
10"
24"
8"
6"
24"
30"
9"
8"
13"
3
2
SPACE EQUALLY
SPACE EQUALLY
SHEER CLAMP
SEAT RISER
FRAME STATION
RIBS
OAK KNEE
℄ MAST
18"
15"
4"
9½"
BASE LINE
SKEG
PLANKING LINE
FLOOR
KEELSON
KEEL
5½"
2½"
8"
SHEER LINE
CHINE LINE
BREAST HOOK
HALF-BREADTH LINES PLAN
DIMENSIONS ARE TO INSIDE OF PLANKING
KEEL LINE
19"
23½"
17¼"
11¾"
22⅜"
18½"
13⅜"
17½"
KEELSON
FLOOR BOARD LINE
PLANKING
SHEER CLAMP
STEM
FENDER STRAKE
OAK KNEE
CHINE CLAMP
TRANSOM
2
3

INBOARD PROFILE AND PLAN OF "PATTY"

Details above show simplicity of construction. A centerboard or detachable fin makes it possible to use *Patty* as sailing dinghy.

NO END of service can be derived from this snappy skiff, *Patty*, an ideal project for the home workshop. Constructed during leisure hours, this craft with many purposes will be ready when the "sailing bug" comes around again. *Patty* is eight and one-half feet long, roomy enough for four persons without crowding and is rowed as easily as [illegible] canoe is paddled.

Patty makes an ideal dinghy, or tender, for a small yacht—sail or power—as she is feather-weight for hoisting and compact for stowing [illegible] deck. Propelled by [illegible] light outboard motor attached to the transom, she is a fast job. On fishing trips, this type and size is just the thing for hauling atop the car or [illegible] a two-wheel trailer. In fact, this flat-bottomed skiff with lap-strake construction is adapted to serve your every need.

Safe in rough water, *Patty* rides waves like a cork without shipping water. The lap-strake planking method makes the "skin" durable and stays leakage. Planks are fastened with clout nails. If a sailing dinghy is preferred, it is [illegible] relatively simple matter to install a centerboard, or a detachable fin.

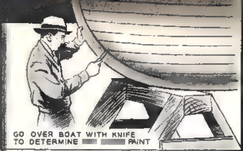
The fact that the mold frames serve as the actual frames of this boat saves much time and effort in construction. Additional ribs to stiffen the hull are put in later.

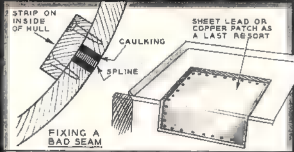
To begin with, make the keel out of 1½"x3" white oak 7 ft., 8½" long. Cut the stem piece out of 1½" white oak to the shape shown in the accompanying sketch, and rabbet accordingly. Notch the stem and splice; water-proof the notches with marine glue and bolt the joint with ⅜"x3" carriage bolts. To the top of the keel fasten a ½"x4" oak keelson with 1¼" No. 8 flat-head galvanized or brass screws.

For best results make a full-sized paper pattern of the stem as well as of the three frames, transom and knees. Reproduce the half-breadth drawings to full size on paper. Frames are of ¾"x1¼" white oak. Fasten frames joints with 1¼" screws, leaving the corners clear for notching out for chines. The ⅝"x1¼" white oak chines should fit flush. Brace the tops of the frames with temporary cross-pieces until the hull is planked.

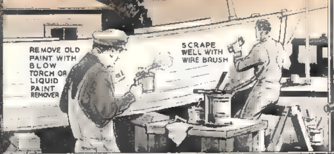
Square and line up the frames at their given stations, holding them with C-clamps until fastened with 2¼" flat-head screws to

If *Patty* is to be taken from the water often, round the end of the skeg to prevent it from catching on the edge of the dock.

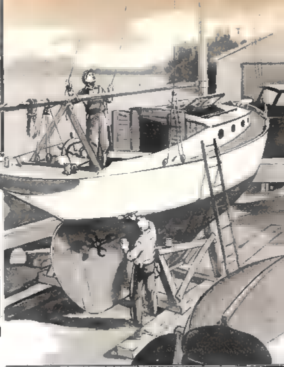

GO OVER BOAT WITH KNIFE TO DETERMINE [redacted] [redacted] PAINT

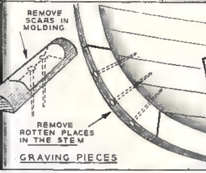


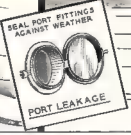
FIXING A BAD SEAM


REMOVE OLD PAINT WITH BLOW TORCH OR LIQUID PAINT REMOVER

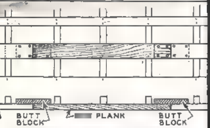
SCRAPE WELL WITH WIRE BRUSH



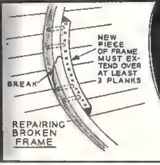

REMOVE SCARS IN MOLDING
REMOVE ROTTEN PLACES IN THE STEM
GRAVING PIECES



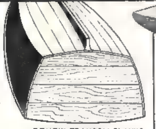
PORT LEAKAGE



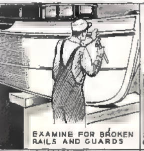
RENEWING A PIECE OF PLANKING

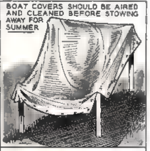


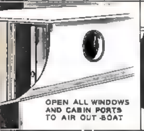
REPAIRING BROKEN FRAME

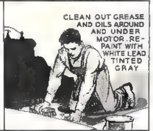

RENEW TRANSOM PLANKS WHERE DAMAGED—EXAMINE WELL ALONG KEEL

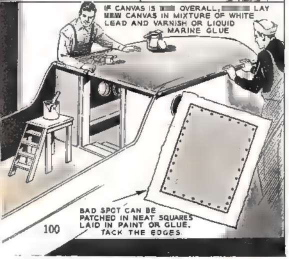
THE SPRING OVERHAUL ON THE BOAT


EXAMINE FOR BROKEN RAILS AND GUARDS


BOAT COVERS SHOULD BE AIRED AND CLEANED BEFORE STOWING AWAY FOR SUMMER


OPEN ALL WINDOWS AND CABIN PORTS TO AIR OUT BOAT


CLEAN OUT GREASE AND OILS AROUND AND UNDER MOTOR. REPAINT WITH WHITE LEAD TINTED GRAY


IF CANVAS IS [redacted] OVERALL, [redacted] LAY [redacted] CANVAS IN MIXTURE OF WHITE LEAD AND VARNISH OR LIQUID MARINE GLUE

BAD SPOT CAN BE PATCHED IN NEAT SQUARES LAID IN PAINT OR GLUE. TACK THE EDGES.

by Sam Rabl

WITH the advent of the first housefly, [redacted] the song of the first robin, those of us who own [redacted] boat begin to get itchy fingers and soon saunter down to the boat yard "just to look her over." A casual inspection will reveal enough to get started [redacted] but with the beginning of every season the inspection of any boat should not be "casual." There is a set system of examination that those who have owned a boat for a number of years have found to be the best and that in the long run will cut the time involved in the overhaul to a minimum.

The first looking-over should be for the discovery of any defects. The old timer will get out his pocket knife and start poking into the wood to discover any "soft spots" hidden under the paint. Paint has a bad habit of hiding the effects of rot, and the seasoned boat owner knows just where to expect to find this menace if it is present. He will start poking the planking at the rabbet in the stem and follow its line from the top to the point where it joins the keel. Should the knife enter very easily at any point, he will start digging away the paint to discover the reason. Let us assume for example that a bad spot does exist. The rotten wood must be removed and graving pieces or "dutchmen" securely fitted so that the strength of the little ship is not impaired. If many rotten areas are found, the entire member should be replaced.

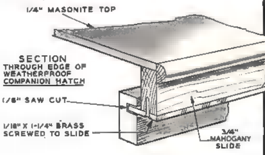
Around the transom and along the keel are other likely places to look for rot. Examination should be made also for damaged timbers due possibly to that hard knock the boat got against the dock last year. Where a plank is badly scarred it would be well to renew the affected length. Any renewed plank should extend over three frames at least, and should be cut at the center of the space between the frames so that butt blocks may be fitted. Never splice in a new plank depending on the frames alone to cover the joint. This is sometimes done in some cheaply constructed boats.

Where frames have been broken, [redacted] length of new frame should be bent in alongside of the damaged [redacted] so that it will cover at least three planks each side of the break. It should be securely fastened to both the broken frame and to the planking.

Worn and scarred places [redacted] the rails and guards should be renewed by fitting an entire new piece, or by graving pieces. After all of the bad places in the hull have been repaired, another thorough going over should be given the hull. In the meantime, if she had a winter cover, this should be given [redacted] thorough airing and drying before it is stowed away for the next lay-up. All of the windows or cabin ports should be propped open to air the inside of the boat. The interior around the bilge should be given [redacted] thorough scrubbing and cleaning and all old oil and grease removed from the interior below the motor. Grease and oil, besides appearing messy, create a fire hazard.

After the bilges have been cleaned they may be painted with a good white lead paint, tinted gray. They may also be given a coat of pine tar oil or creosote, both of which [redacted] somewhat smelly; or they may be given a coat of whitewash which will give the boat a sweet and clean odor and which will in a great [redacted] protect it from dry rot. A strong solution of salt water in all the dark places will also be a good preservative from rot. The decks and cabin top should now be gone over and any bad places repaired. If the canvas is worn and cracked in many places the best thing to do is to renew it. All the moldings should be removed and the old canvas torn off. The new canvas is laid in a mixture of white lead and varnish or in liquid marine glue, made especially for this purpose. A good trick after laying canvas is to prime it with a thin coat of casein glue, which when set can be sanded to a very smooth surface.

If the canvas is bad only in spots these can be repaired with neat squares of new canvas laid in paint or glue and their edges neatly tacked. Another good trick is to apply hard



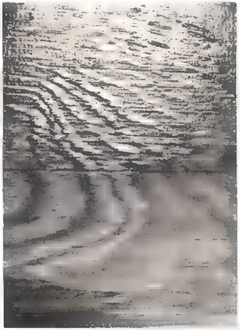
SECTION THROUGH EDGE OF WEATHERPROOF COMPANION HATCH

HOW TO GET A MASTER FINISH WITH UNSKILLED HANDS . . . .

MODERN paints give to the amateur the ability to do [redacted] paint job possible in past years only by the skilled craftsman. Manufacturers and experienced chemists have been working hand in hand to improve finishing materials so that anyone who can wield a paint brush at all [redacted] secure results that would astonish the old-time professional decorators.

Much of the experience that was formerly required in manipulating the brush is now incorporated in the paint itself. This is particularly true in the case of interior finishes such [redacted] enamels and varnishes. A great many of them [redacted] "self-leveling," which to the layman [redacted] that brush marks left by an awkward hand will automatically be leveled out of sight. Most of them will dry in four hours or so, which [redacted] that home routine need not be disrupted for days at a time as in the past.

"What make of finish shall I use?" is not such an important question if it is asked regarding any of the well-known brands. The manufacturer, proud of his product, states on the label in simple language exactly what it is intended for and how it is to be used. You can rely [redacted] that information; it has been tested time after time.



A simple [redacted] of determining if the surface [redacted] dry is to sprinkle some salt over a test piece of wood painted [redacted] same time as the original. If the salt brushes off without marring the finish, it is dry. Above—An example of the value of sandpapering. Top strip was not smooth when finish was applied, while bottom sectio[redacted] thoroughly sandpapered. Below—A [redacted] of enamel makes this table look like new.

Above (left)—To test the quality of enamel or varnish, coat a small piece of tin. When it is dry, the finish should not crack, peel or check when the tin is bent around a ⅛ inch rod. Above—To make cleaning of the hands easy after the painting is done, rub some vaseline over them before starting [redacted] paint. Left—A small sprayer will give a fine finish to small articles. Use a spare tire for the compressed air supply

However, what about the cost? This good paint, good varnish or enamel, certainly appears to be expensive. A small can of it may cost a dollar or more, while down the street you can get [redacted] similar-sized can for a fourth of the money, perhaps with [redacted] brush included.

Experience is a good, but very costly teacher where paint is concerned. A cheap four-hour enamel may possibly be applied with the same amount of time required to brush on a reliable make. It may dry in four hours, or it may still be tacky [redacted] week later, according to the luck that the manufacturer had with the compounding of that particular batch. The most disappointing part, however, is its inferiority on the points most desirable in a good finish. These are (1) the ability to preserve and protect the surface to which it is applied. (2) Appearance; it should brighten the interior or exterior of a home. Thirdly, it should promote sanitation and be easy to keep clean; finally, a durable, lasting finish meeting the foregoing qualifications should increase the value of the property. These requirements are obviously not met in a cheap material that quickly becomes dull, fades, may become tacky during humid weather and is liable to peel or crack after [redacted] few weeks or months.

A good finish is one that dries hard, yet retains enough flexibility and elasticity so that it will not check when the surface to which it is applied expands and contracts due to temperature changes. To make a good comparative test, coat a small strip of tin with the paint, varnish or enamel and allow it to dry well. It should not check or show the least sign of stress when the strip is bent around a ⅛-inch rod (such as the shank of a drill bit). Some good grades of enamel,

If, when your finger is rubbed over a painted surface, some of the paint rubs off, immediate repainting is necessary.

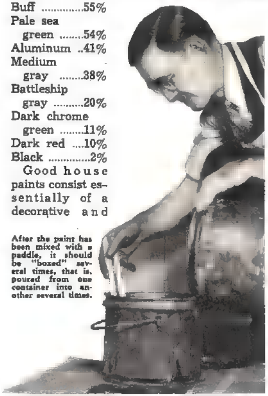
The proper method of applying paint is as follows: Dip the end of the Brush into the paint; slap it lightly against the side of the pail, and give the brush a half turn before applying it to the [redacted]. This prevents paint from dripping from the brush. Work it out with the grain, and then across the grain. Finish with light strokes with the grain.

Always [redacted] painting a house on the north side. Work around so that the sun remains ahead.

when put to this test, [redacted] even be crumpled and pounded and not the least sign of a crack will appear.

Perhaps you are wondering just what color or shade would be most suitable inside or outside your home. Much depends on whether you wish to brighten up a dark room, or to tone down the brightness. Good paint will do either. The "brightness" of a film of paint or enamel indicates the percentage of light that it will reflect. Some time ago an accurate check [redacted] made of the reflecting powers of the different colors of pigments used in good quality finishes, and it is quoted here to aid you in controlling the brightness range of a room you intend partially or entirely redecorating. The figures refer to the percentage of light reflected:

Good white paint	84%
Pearl gray	72%
Light green	70%
Pink	70%
Ivory	65%
Buff	55%
Pale sea green	54%
Aluminum	41%
Medium gray	38%
Battleship gray	20%
Dark chrome green	11%
Dark red	10%
Black	2%


After the paint has been mixed with a paddle, it should be "boxed" several times, that is, poured from one container into another several times.

Good house paints consist essentially of a decorative and protective pigment suspended in a drying oil, which serves as a binder, with a thinner and other ingredients added to suit the type of work to be covered. Ordinarily the pigments consist of zinc oxide and white lead, with the addition of a smaller quantity of tinting pigments. On the proportion of zinc and lead depends the suitability of [redacted] paint for a given purpose. A paint composed mostly of zinc will have great covering power, because of its greater ability to reflect light, but [redacted] it ages it unfortunately becomes brittle and cracks, and can easily be chipped from the unprotected wood with a fingernail. On the other hand, a lead-type paint does not have a tendency to peel but it does, on becoming old, dry out into a chalky powder which readily rubs off. These two counter influences are taken advantage of in good quality paints by combining the lead and zinc in scientifically correct proportions [redacted] that each counteracts the deficiency of the other.

When painting sash, it will be easy to remove dabs from the glass if the edge is first coated with whiting-and-water paint.

If the job is one of repainting you will save money by seeing that the old surface is absolutely clean, free of dirt and oil, and in

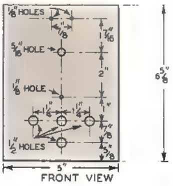
[*Continued on page* 145]

THE "2-3" PORTABLE

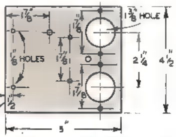
by G. W. Shuart

Two tubes give three-tube performance in this easily constructed portable receiver.

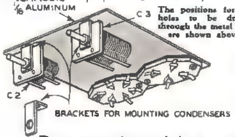
The completed set in use. The binding post at the left is for the [redacted] connection. All batteries [redacted] in the cabinet.



[redacted] the parts specified [redacted] used, the layout above should be followed. This view is of the front of the all-metal cabinet.



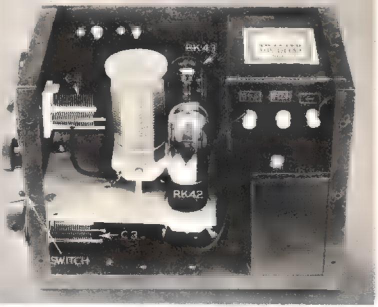
The positions for the holes to be drilled through the metal base are shown above.



The antenna condenser and the regeneration control condenser are mounted [redacted] the under side of the base. The bracket for C2 must be insulated from the chassis by means of fibre washers top and bottom. Metal [redacted]shers should be used with the bracket for C3 so that the chassis rests level.

WHEN warm weather brings the urge to spend more time outdoors, some radio fans hesitate to build [redacted] portable receiver because of the cost and trouble of construction. However, with this set, neither of these problems is of large proportion. The cost of parts is sufficiently low so that almost any experimenter will find that the pocketbook is not strained very much. When the junk box is brought out and examined for possible parts that can be used, usually the final cost will be reduced to [redacted] very few dollars. The actual construction is simple enough so that a single weekend of work will result in [redacted] completed set, ready for use wherever its owner wishes to take it.

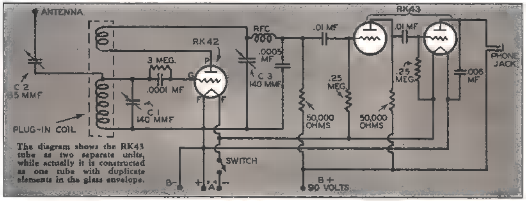
There is nothing tricky or odd about this receiver. It uses new tubes, but these are really "old tubes" with a different type of filament. These tubes [redacted] designed for battery service and operate on 1.5 volts, thus permitting the use of a single "A" battery. The space thus conserved means that the set is much more compact and weighs considerably less than previous types of portables. The complete set, including everything but the earphones, is contained in [redacted] split metal case 6¾ inches high, 5 inches wide and 8¾ inches deep. This case is available at most radio supply stores. The builder may want to use some other type of construction, whereby the earphones can be housed in a small compartment; he will find many other sizes and types of cases available, or he may even go so far as to construct his own case of wood. If so, a metal panel is recommended to reduce "hand-capacity" effects. A piece of $\frac{1}{16}$" aluminum 5"x4½" is used for the subpanel. The midget condensers C2 and C3 are mounted underneath this aluminum plate. When they are fastened to the front of the case, they serve as a support for one end of the chassis. This makes a very convenient arrangement and it is necessary to employ only a long screw to support the rear of the base plate. The entire r.f. and audio portion is built on this small base.



This photograph shows the position of the batteries inside the [redacted] The tuning condenser is mounted on the front of the cabinet, while the other two are mounted below the chassis. The various small parts—condensers and resistors—are supported by their own wires on the underside of the chassis.

The antenna condenser C2 and the regeneration condenser C3 are mounted on the under side of the base; [redacted] [redacted] the two tube sockets. The coil socket is mounted [redacted] top. This arrangement is absolutely necessary because the three sockets are so close together that they would interfere with each other [redacted] they were all mounted on the top of the chassis. Place small washers between the underside of the chassis and the tops of the tube sockets, to prevent the rivets on the latter from "shorting" against the aluminum. Raise the coil socket about ¾" above the chassis by small collars [redacted] piles of washers.

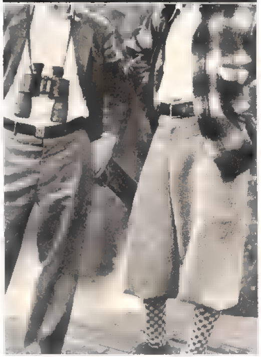
[*Continued on page 147*]



The diagram shows the RK43 tube as two separate units, while actually it is constructed as one tube with duplicate elements in the glass envelope.

What To Do About Parallax

Above: Taken with the same camera, these pictures show that the view-finder is definitely out of line and needs adjustment. Below: Bringing the camera too [illegible] to the [illegible] sometimes gives this effect.

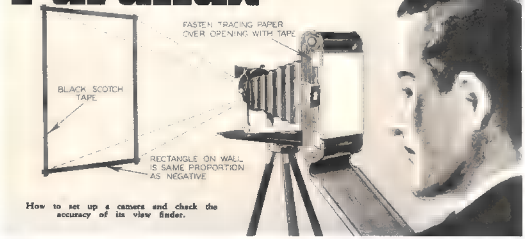


PRACTICALLY all cameras fitted with eye-level view finders suffer from a common trouble known as "parallax." Though not many camera owners recognize this word, they probably all have sworn plenty at it.

Parallax is the displacement of the image as seen in the view finder in relation to the actual image as recorded on the film. You hold the camera to your eye, squint carefully at a person six or eight feet away and move the camera around until you think everything is showing. When you develop the roll, you discover to your dismay that part of the head or legs is cut off, or the figure is off center completely. The error usually is greatest when close-ups are attempted at distances of three to five feet, which is about as close as most cameras will work without supplementary lenses.

With miniature cameras parallax is a particularly serious matter because the whole negative area is small enough even if all of it is used. If it is necessary to back away from the subject a good deal in order to be certain of getting a whole head, for instance, on the film, the resulting image is tiny and must be "blown up" considerably if a print of decent size is to be made. Beyond about fifteen feet the trouble practically disappears, as the ratio of displacement becomes very small. Most eye-level view finders are very accurate from infinity focus to ten, twelve or fifteen feet (depending entirely on the particular camera), not quite as accurate at slightly shorter distances, and quite inaccurate for intimate close-ups. A permanently fixed view finder is thus something of a compromise.

The makers of the more expensive miniatures frankly and honestly tell people what to expect in this regard. For camera fans who want to be absolutely certain of what they are "shooting," they supply separate, attachable view finders having micrometer adjustments that eliminate parallax entirely. The system is as follows: First you look through the range finder and focus carefully on the subject. You observe the distance on the lens barrel or focusing mount, and then simply turn the parallax adjustment to read to this same figure. What you then see through the special view finder is exactly what you will find later on the negative.



FASTEN TRACING PAPER OVER OPENING WITH TAPE
BLACK SCOTCH TAPE
RECTANGLE ON WALL IS SAME PROPORTION AS NEGATIVE

How to set up a camera and check the accuracy of its view finder.

The only catch to this ideal arrangement is that the view finders are practically miniature cameras in themselves, with finely corrected optical elements, and cost about $25.

Fortunately for the owners of more modestly priced cameras, it is a very simple matter to determine the accuracy of any view finder at specific distances, and to make approximate but adequate provision for the parallax.

For your test "image," select any light colored blank wall in any convenient room. In any stationery or chain store, buy a ten-cent roll of black "Scotch tape." This is like the old-fashioned gummed mending tissue you used in school to fix up torn pages in books, but it requires no wetting and is instantly removed from any surface without leaving marks. Set up the camera on a tripod or on the edge of a table. Adjust the focusing device so that the lens is out to the maximum—the camera is thus set for taking pictures at its shortest possible distance. No film is needed; open or remove the back of the camera and by means of rubber bands or strips of the Scotch tape hold a piece of tracing paper, tracing cloth, a fine silk handkerchief, or even ordinary tissue paper over the space normally occupied by the film.

The idea is to mark off a rectangle on the wall with the black tape and to illuminate it with any strong light; a photoflood is fine. The rectangle should be in proportion to the negative size. For instance, if the film measures 2¼x3¼ inches, the black "frame" can be about 4x6 feet. Put a dark cloth over the camera, open the lens wide and set the shutter at "T" (time) and move the camera around until you can clearly see the black box on the improvised focusing screen. Line it up carefully so that it covers the full negative area; if necessary, adjust the tapes to form a smaller or larger outline that fills the negative at the shortest focusing distance.

Now lock the tripod adjustment and move your eye to the view finder. The extent of the parallax with your particular camera will then be instantly evident.

Repeat the experiment with the camera moved back from the wall at various distances, and at each stage, draw a rough pencil sketch showing how much "off" the finder is. You will then know how much to tilt the camera, and in what direction, in order to be reasonably certain of having the negative cover the desired subject at the critical short distances.

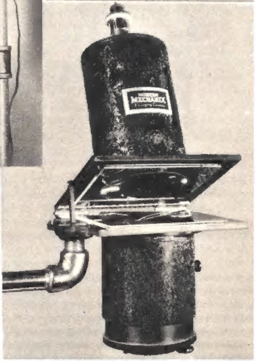
[*Continued on page* 141]

The MI "Minineg" ENLARGER

by Kenneth Murray

Negatives from 35 mm. to 2¼ x 2¼ inches are handled with ease and can be "blown up" 10 diameters.

The upright is a 31" piece of 1" pipe, attached to a 5-ply baseboard, 14x18", by a 1" floor flange. The 1" Tee, with its threads filed off, slides on this pipe; a thumbscrew on opposite side locks it in any position. A ½x4" nipple joins enlarger head to sliding Tee by means of 90 degree elbow.



The enlarger open, ready to receive negative. Film is simply placed, emulsion side down, on the lower glass; hinged top, section of enlarger is then closed down, thus flattening the negative and keeping it in position.

TEN-DIAMETER projection prints made with the "Minineg" enlarger have that crisp, wire-sharpness that you usually expect only of contact prints. This trim-looking, compact little device is versatile. It will enlarge miniature negatives up to 2¼x2¼ inches in size and, like the 9x12 cm. MM Enlarger described in the March, 1938 issue, will handle small sections of larger negatives.

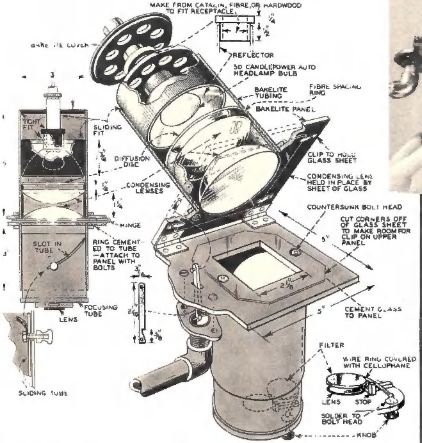
The Minineg follows somewhat the design of the 9x12 cm. enlarger, and uses the same baseboard and upright; a single bushing for the 1-inch tee makes them interchangeable. The unusual compactness is due to the use of a 50-c.p. automobile headlamp bulb, which is extremely *cool* in operation but supplies an adequate volume of light. Two 3-inch plano-convex condensers, located almost in contact with the negative, assure unusual brilliance and crispness of detail.

In constructing the Minineg, three types are available for selection. They differ only in appearance, design and operation being identical. The cheapest to make is the Regular; then there are the Deluxe and the Super-deluxe. Exclusive of condensers and projection lens, you can make the Regular for less than a dollar; the materials consist of ¼-inch black tempered Prestwood, with focusing and lamphouse tubes formed of sheet metal. Materials for the Deluxe, which is shown in the illustrations, consist of a black Bakelite radio panel and Bakelite tubing of the kind used for winding radio coils. Lastly, for the Super-deluxe, use Catalin. This can be obtained in sheets and tubes and the cost will not run over several dollars. This beautiful plastic material is obtainable in many colors and will not require outside finishing or lacquering if a non-actinic red mottle shade is chosen. A special cement is desirable, although Duco cellulose cement will hold the Catalin parts quite well.

You can get a pair of 3-inch unmounted condensing lenses for $1.50, and a good projection lens will cost from $5.00 up. Used and new bargains are continually offered by the larger camera shops. A 3- or 3¼-inch anastigmat with aperture of f. 4.5 is standard for the Minineg. A shutter is not necessary.

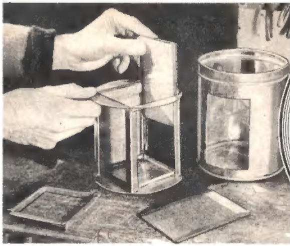
The Deluxe Minineg is shown in the illustrations, and with the drawings you will not find that construction is at all difficult. You can get the Bakelite panel at any radio supply house, but to secure the correct sizes it was necessary to purchase the Bakelite tubing from two different concerns: 3-inch (*inside diameter*) tubing was secured from Allied Radio Corp., and 3-inch (*outside diameter*) tubing from Wholesale Radio Service Co., both in Chicago. The latter tubing makes a very smooth fit inside the former, and the price is only 7c an inch, and less in 1-foot

The lamp unit. Holes in the cover provide good ventilation.



MAKE FROM CATALIN, FIBRE, OR HARDWOOD TO FIT RECEPTACLE
¼
½
BAKELITE COVER
REFLECTOR
50 CANDLEPOWER AUTO HEADLAMP BULB
BAKELITE TUBING
FIBRE SPACING RING
BAKELITE PANEL
3
TIGHT FIT
SLIDING FIT
DIFFUSION DISC
1¼
CONDENSING LENSES
1¼
CLIP TO HOLD GLASS SHEET
CONDENSING LENS HELD IN PLACE BY SHEET OF GLASS
COUNTERSUNK BOLT HEAD
CUT CORNERS OFF OF GLASS SHEET TO MAKE ROOM FOR CLIP ON UPPER PANEL
5"
HINGE
RING CEMENTED TO TUBE —ATTACH TO PANEL WITH BOLTS
SLOT IN TUBE
3/16"
2⅛"
2 1/16
3/8"
FOCUSING TUBE
LENS
CEMENT GLASS TO PANEL
5"
FILTER
WIRE RING COVERED WITH CELLOPHANE
LENS
STOP
SOLDER TO BOLT HEAD
KNOB
SLIDING TUBE

Above — How the Minineg is focused. The left hand turns the focusing tube in or out, and the right one locks it by means of a binding post nut and a short machine screw passing through both the fixed and sliding tubes. (See extreme lower left detail in accompanying drawing.) Left—Phantom cut-away view of the entire enlarger. Study this carefully before starting construction and you will have no trouble. Note particularly how the lower Bakelite panel mounts to the short piece of piping by means of a small flange, a short nipple and a 90 degree elbow. These are inexpensive fittings.

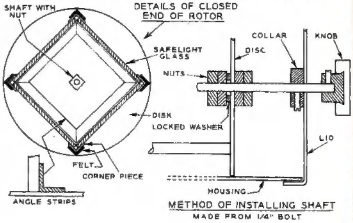


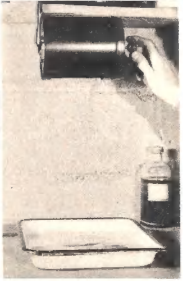
ROTARY SAFELIGHT LAMP

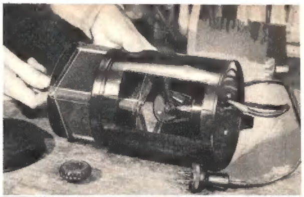
by Walter E. Burton

SAVES DARKROOM TIME

The photograph above shows clearly how the four-position safelight operates. Although light passes through all the safelights at one time, it passes out through the housing through only one section at a time. The corners of the rotor are padded with strips of felt to prevent the possibility of light leakage.


SHAFT WITH NUT
DETAILS OF CLOSED END OF ROTOR
SAFELIGHT GLASS
DISK
FELT
CORNER PIECE
ANGLE STRIPS
COLLAR
KNOB
DISC
NUTS
LOCKED WASHER
LID
HOUSING
METHOD OF INSTALLING SHAFT
MADE FROM 1/4" BOLT



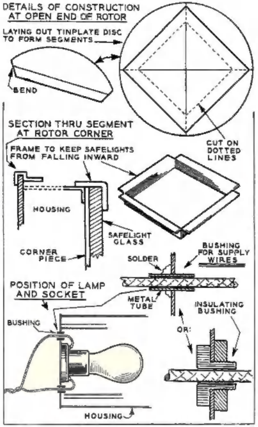


THE usual photographic darkroom arrangement of a single safelight lamp whose color screen must be slipped out and another one inserted every time a different type of paper or film is to be developed, can become a distinct nuisance, particularly when the changeover is attempted with wet hands. A rotary safelight lamp similar to that illustrated will eliminate such trouble by permitting screens to be changed merely by the turn of the knob.

This four-position safelight unit consists of a rotor, carrying standard safelights, that revolves inside a cylindrical housing having a rectangular opening in the side. A single lamp in a surface-mounting socket projects into the rotor, light from it passing through all the safelights at once, but emerging from the housing through only one at a time. Corners of the rotor, which has a square cross section, are padded with felt strips, to prevent light leakage.

Among the materials needed are the following: One empty can of the type in which 5-pound quantities of sodium sulphite and sodium carbonate are sold by photo dealers, and measuring about 5¼ inches in diameter by 6¼ inches deep; a quantity of tinplate for the rotor (empty tin cans can be used); one ¼-inch bolt 3 inches long; radio knob, to fit end of bolt after head has been removed; 4 strips of felt ½ inch wide and 5 inches long, preferably dark in color; one small angle bracket similar to those used for bracing corners and supporting shelves; one surface-mounting lamp socket and a 15-watt lamp, with necessary cord and plug; four rectangular safelights each measuring 3¼ by 4¾ inches; miscellaneous materials including black lacquer, solder, and casein-latex cement or similar adhesive for fastening felt to metal.

Obtain the safelights and build the rotor to fit them, and at the same time fit it inside the can that is to become the housing. Wratten safelights are standard in this country, and can be purchased for about 40 cents each in the size specified. For complete flexibility with all photographic materials, the following are needed: Series OO, a clear yellow color, for use with contact-printing papers; Series OA, greenish yellow, for use with bromide enlarging paper and lantern slide plates; Series 2, red, for use with orthochromatic films and other materials sensitive to green but not red; Series 3, green, for use with panchromatic plates and films. For the extremely rapid panchromatic films that have been placed on the market recently, development in total darkness is best.


DETAILS OF CONSTRUCTION AT OPEN END OF ROTOR
LAYING OUT TINPLATE DISC TO FORM SEGMENTS
BEND
CUT ON DOTTED LINES
SECTION THRU SEGMENT AT ROTOR CORNER
FRAME TO KEEP SAFELIGHTS FROM FALLING INWARD
HOUSING
SAFELIGHT GLASS
CORNER PIECE
BUSHING FOR SUPPLY WIRES
SOLDER
POSITION OF LAMP AND SOCKET
METAL TUBE
INSULATING BUSHING
BUSHING
OR:
HOUSING

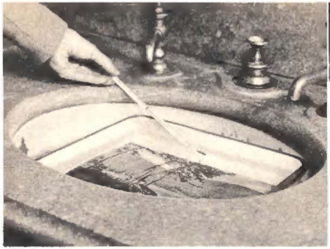
Cut two discs of tinned sheet iron, such as that from the sides of an empty tin can, of a size that will permit them to be inserted, flatwise, into the housing. In the center of one disc drill a ¼-inch hole, to receive the bolt to which the knob used to rotate the safelights will be attached. Mark out, on this same disc, a square whose sides are about 1/16-inch longer than the width of the safelights. Cut four pieces of tin to the same length, and about ⅜-inch wide, and bend them lengthwise along their center lines, to make right-angle pieces. Solder these to the disc as shown, to form a square frame against the outside of which the ends of the safelights will rest.

Cut four strips of tin measuring 1 by 4 11/16 inches, and bend them at right angles along their center lines, to form corner pieces of the rotor. Set the safelight glass temporarily in position outside the square frame, place the corner pieces outside the glass, and mark the places where the ends of these pieces meet the disc. Remove the glass and solder the corners in place, applying solder only along the outside, so it won't pile up near the glass.

Mark the other disc with a square the same size as the first one, and then make a smaller

[*Continued on page* 136]

Photo Short Cuts

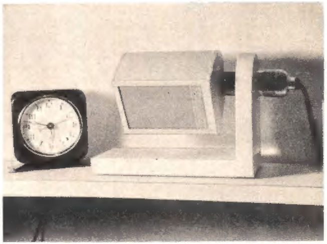


Developer Temperature Is Easily Regulated

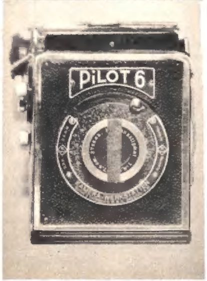
If you do your developing in the bathroom, it is a simple matter to maintain an even temperature of solutions in a tray. Simply float the latter in the hand basin, adding hot or cold water as indicated by the thermometer. Be careful water doesn't splash into the tray.

Simple Wooden Stand Improves Brownie Safelight

A simple stand for a Brownie safelight can be made from two pieces of wood, as shown at right. Make the mounting hole slightly smaller in diameter than the end of the socket which receives the lamp and then increase the diameter of the hole gradually with a file until the socket can be pushed through it in a snug fit. Glue, smeared on hole rim, will aid in anchoring the socket.



Tape On Lens Gives Stereoscopic Effect



Good Flash-Bulb Fires "Dead" One

A flash-bulb that fails to go off in the usual manner can be made to fire by arranging it so that the glass part just touches that of another good bulb (right). The "dead" bulb will fire when the good one goes off, its flash occurring only about 1/100 second later. →

← A strip of Scotch tape pasted on the front of a lens, as shown at left, will "fuzz" the background of any picture, making the object or person in the foreground stand out like a stereoptican picture. Tape should cover about one-fourth of the lens.

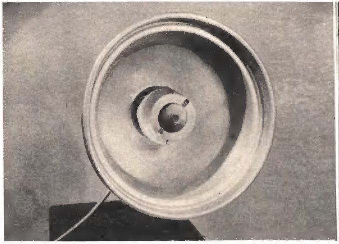
How To Grind Glass For Photo Use

Make your own ground glass for enlargers, etc., by rubbing any paste abrasive between glass sheets with a circular motion (above).

Clothespin Serves As Thermometer Handle

Checking the temperature of developer solution in a large bottle with a slippery stirring rod is risky, especially when the fingers are wet. Clipping a spring clothespin on the thermometer, as shown above, will provide a satisfactory handle and lessen chance of breaking the thermometer.

Lamp Shade Clip Improves Reflector



It is sometimes difficult to make good pictures of people indoors with photoflood lamps unless the latter are diffused in some manner. A lamp shade adapter with its center hole covered by a washer and bolt (above) makes an ideal "cap" to clip over the end of a bulb so that only light from the reflector shines on the subject.

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Chemical Method Of Vignetting Prints

Large prints can be vignetted smoothly and cleanly, fading out to a perfect white at the edges, by a chemical method instead of the usual dodging method. Expose the print without masks or dodging, dip into plain water and then dip the finger in developer solution and rub it over the part to be brought out (right). →

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